C. V. Morton
U. S. National Museum.

U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF BOTANY.

CONTRIBUTIONS

FROM

THE U. S. NATIONAL HERBARIUM.

Vol. III.

REPORTS ON COLLECTIONS, REVISIONS OF GROUPS,
AND MISCELLANEOUS PAPERS.

REVISIONS OF NORTH AMERICAN GRAMINEÆ AND CACTACEÆ, STUDIES OF SPECIAL GROUPS, AND CATALOGUES OF PLANTS COLLECTED IN NEBRASKA, IDAHO, SOUTH DAKOTA, KANSAS, WYOMING, ALASKA, AND MEXICO, WITH GEOGRAPHIC REPORTS AND DESCRIPTIONS OF NEW GENERA AND SPECIES.

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ERRATA AND ADDENDA.

Page 153. After "KUHNISTERA CANDIDA OCCIDENTALIS Rydberg," insert the description beginning at fourth line from bottom of p. 154.

Page 167. Line 18, for "Plate I" read "Plate II."

Page 180. Transpose "**Leptorchis lœselii,**" etc., with preceding line.

Page 212, facing. In legend of Plate III, for "SANDBERGII" read "LEIBERGII."

Page 229. Under **Lonicera utahensis,** for "Waha" read "Lake Waha."

Page 230. Under **Gutierrezia euthamiæ,** strike out first sentence.

Page 275. After **Hylocomium robustum,** insert: **Hylocomium squarrosum** (L.) Bruch & Schimp. Bryol. Eur. t. 492 (1851–1855); *Hypnum squarrosum* L. Sp. Pl. ii, 1127 (1753). Hope, Kootenai County, August (No. 1125).

Page 463. First line of text, after "May 26," insert "1892." Line 13 of text, for "July 7" read "June 7."

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PREFATORY NOTE.

In the act of Congress making appropriation for the Department of Agriculture for the fiscal year ending June 30, 1889, provision was made for botanical exploration and the collecting of plants in little-known districts of America, in connection with the United States National Herbarium; and since that time a similar provision has been made annually. As a partial result of these appropriations, the Division of Botany has issued heretofore three completed volumes, I, II, and IV, of a series of publications entitled Contributions from the United States National Herbarium. The present volume consists chiefly of reports on the collections made by agents of the Department of Agriculture under the acts mentioned.

FREDERICK V. COVILLE,
Botanist, U. S. Department of Agriculture,
Curator, U. S. National Herbarium.

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U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF BOTANY.

CONTRIBUTIONS

FROM

THE U. S. NATIONAL HERBARIUM.

Vol. III. No. 1.

ISSUED FEBRUARY 25, 1892.

MONOGRAPH OF THE GRASSES OF THE UNITED STATES AND BRITISH AMERICA.

BY

DR. GEO. ~~VASEY~~

BOTANIST, DEPARTMENT OF AGRICULTURE.

MISSOURI BOTANICAL GARDEN.

PUBLISHED BY AUTHORITY OF THE SECRETARY OF AGRICULTURE.

WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1892.

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
November 20, 1891.

SIR: I have the honor of herewith presenting for publication the first number of the "Grasses of the United States and British America."

Respectfully,

GEORGE VASEY,
Botanist.

Hon. J. M. RUSK,
Secretary.

INTRODUCTION.

For a long time the botanists of this country have felt the want of a general work on the grasses of the United States. For several years I have had such a work in contemplation, and now venture to present to the public the first part of the same. It has been prepared in connection with numerous official duties, and is not in all respects as complete as I could wish it to be. There are many difficulties of identification and synonymy, particularly respecting the grasses of the Pacific coast and of our southwestern boundary. A number of these have been named from descriptions of some of the old botanical explorers without access to the original types. Botanists in general know the difficulty of identification from the commonly brief descriptions of writers, and they will not be surprised if many changes or modifications will be needed whenever it is possible to examine the original specimens.

I wish to return thanks to Prof. Edw. Hackel, of St. Poelten, Austria, for the privilege of making such use as I found convenient of the analytic tables in his excellent work on "The True Grasses," as translated by Scribner and Southworth.

A complete synopsis of the tribes and genera will appear with the second part of this work.

I hope to follow this part within a few months with the remaining portion of the work, and in the meantime solicit from botanists notes, criticisms, or information such as they may deem worthy of attention.

GEO. VASEY.

WASHINGTON, *November* 20, 1891.

NATURAL ORDER GRAMINEÆ.

Flowers hermaphrodite, or unisexual. Stamens usually 3 in a whorl, rarely by abortion reduced to 2, or 1, or by duplication raised to many. Ovary entire, 1-celled, 1-ovuled; usually with two, rarely one or three styles, free or united at the base. Fruit a small seed-like nut or caryopsis, the thin membranaceous pericarp usually closely adnate to the seed, in a few genera free and loosely surrounding the seed. Embryo small on one side of the base of the albumen. The floral organs in the axils of enveloping chaff-like scales or bracts, the one usually inclosing the flower called a palet, usually 2- rarely 1-nerved; another scale standing opposite this and usually more or less completely inclosing it called the flowering or floral glume, usually 3- to many-nerved.—Usually one to several minute scales called lodicules between the glume or palet and ovary; these, together with the palet, sometimes wanting. The parts above enumerated constitute a spikelet, which may be solitary, and inclosed by another pair of bracts called empty glumes, or there may be two to many spikelets, alternating on a rachis with a pair, or sometimes several empty glumes below, the whole constituting a several- or many-flowered spikelet. The spikelets may be variously grouped in spikes, racemes, or panicles.

Grasses are usually herbaceous, erect, or decumbent, or creeping and rooting at the lower nodes, sometimes suffrutescent, shrubby, or arborescent, the culms usually hollow between the closed nodes. Leaves alternate, parallel veined, usually long and narrow, sheathing the stem at their base, often having at the top of the sheath within a scarious or ciliate appendage called a ligule.

SYNOPSIS OF TRIBES AND GENERA.

1. Tribe MAYDEÆ.

Inflorescence monœcious, spicate, the male and female spikes distinct and on different parts of the plant or connected; when connected the male flowers occupying the upper portion of the spike or spikes, and the female or fertile flowers the lower part.

The genus *Coix* is frequently cultivated under the name of Job's tears.

The genus *Euchlæna* is cultivated in the South as a forage plant under the name of Teosinte.

The genus *Zea*, species *mays*, is commonly and extensively cultivated throughout the country, and is known as maize or Indian corn.

As natives of this tribe we have only the genus *Tripsacum*.

2. Tribe ANDROPOGONEÆ.

Spikelets in racemes or spikes, most commonly in twos, occasionally in threes, at each joint of the (usually) articulate rachis, one sessile and one pediceled, or the terminal ones in threes. Spikelets homogamous or heterogamous, generally 1-flowered, with 3 empty glumes; first empty glume more indurated than the inner ones, and than the flowering glume, the latter often hyaline and bearing a bent or twisted awn. Palet usually minute, sometimes absent. Stamens 3, rarely 2 or 1. Style free, stigma plumose.

Group 1.

Spikelets in spike-like racemes, awnless, generally in pairs in alternate notches of the generally articulate rachis; one, rarely two, sessile and fertile, more or less imbedded in an excavation of the rachis, the other pediceled and sterile.

A. General rachis not deeply indented at the joints..... .....Elionurus, 6
B. General rachis deeply indented or excavated at the joints.
I. Spikes more than an inch long; sessile spikelets flat or convex.
Rottbœllia, 7
II. Spikes less than an inch long; sessile spikelets small and globular.
Manisuris, 7

Group 2.

Spikelets in pairs or threes, one sessile and fertile, and one or two pediceled, male, empty or defective, arranged in spikes or loose racemose panicles, the flowering glume of the sterile flower commonly awned.

A. Sessile spikelets male, the pedicellate one perfect.....Trachypogon, 7
B. Sessile spikelets perfect, the pedicellate one male .....Heteropogon, 8

Group 3.

Inflorescence paniculate, consisting of many spike-like racemes of numerous joints; spikelets in pairs or threes, the sessile one fertile, usually awned, the pedicellate one either fertile, male or imperfect. Axis of the racemes distinctly articulate (usually bearded).

A. Spikelets in pairs along one side of a simple spike, or of the spike-like branches of a simple panicle.....Andropogon, 9
B. Spikelets in single or few pairs on the branches of a more or less compound panicle

I. **Panicle loose, the branches not sessile.**
  * Outer glumes membranaceous or narrow and rigid, with 2 prominent lateral nerves ..... CHRYSOPOGON, 9
  ** Outer glumes when in fruit hard, smooth, and shining ..... SORGHUM, 13

II. Panicle strict, the branches sessile.
  * Spikelets in pairs, awned, both perfect ..... ERIANTHUS, 8
  ** Spikelets in pairs, awnless ..... IMPERATA, 8

3. Tribe ZOYSIAE.

Spikelets in groups of two to five, usually 1-flowered, the flowering glume always awnless, membranaceous; the empty glumes of firmer texture and frequently awned.

A. Two outer spikelets male, each 2-flowered, the inner spikelet perfect, 1-flowered ..... HILARIA, 13
B. Lowest spikelet of each group sterile, terminal one fertile, 1-flowered, with delicate glumes ..... ÆGOPOGON, 14
C. Uppermost spikelet of each group sterile, second empty glume coriaceous, with hooked spines on the back ..... TRAGUS, 15

4. Tribe PANICEÆ.

Spikelets 1- or occasionally 2- flowered, the second flower male or neutral (very rarely perfect) in the axis of the third glume, arranged in spikes, racemes, or panicles; flowering glume and palet of the perfect flower always firmer in texture than the empty glumes, unawned; empty glumes rarely awned.

A. Spikelets all perfect (hermaphrodite), neither sunken in an excavation in the rachis nor subtended by a large leaf-sheath.
  I. Empty glume 1 ..... REIMARIA, 15
  II. Empty glumes 2; perfect flowers single.
    * Spikelets with a swollen, ring-like callus at the base ..... ERIOCHLOA, 21
    ** Spikelets without a swollen callus at the base.
    – Spikelets sessile, or nearly so, in one-sided spikes, these frequently in pairs or panicles ..... PASPALUM, 15
    ± Spikelets not sessile in one-sided spikes, but in panicles, and pedicellate.
      (*a*) All the spikelets alike in terminal panicles ..... ANTHÆNANTIA, 20
      (*b*) Spikelets of two kinds; first, the sterile, borne on a terminal panicle; second, the fertile, borne on short subterranean branches.
      AMPHICARPUM, 20
  III. Empty glumes 3, perfect flowers 1, or a flowering glume with male flowers instead of the third empty glume.
    * First and second empty glumes without a distinct callus, awnless ... PANICUM, 22
    ** First and second empty glumes awned ..... OPLISMENUS, 37
  IV Spikelets single or in pairs, subtended by an involucre consisting of from one to many bristles or spines (sterile branches), which are sometimes grown together.
    * Spikelets falling at maturity; bristles persistent ..... SETARIA, 37
    ** Involucral bristles falling off with the spikelets at maturity.
    – Bristles numerous, rigid, thickened at the base, frequently grown together.
    CENCHRUS, 39
    ± Bristles usually numerous, apparently whorled, delicate, not thickened at the base, often plumose ..... PENNISETUM, 39
B. Spikelets without bristles, sunken into cavities of the one-sided broad rachis of the short spikes ..... STENOTAPHRUM, 40

5. Tribe ORYZEÆ.

Spikelets perfect or unisexual, 1-flowered; flowers apparently terminal and inclosed by a flowering glume and a palet, which is usually 1-nerved. Empty glumes 2 or more, very seldom numerous. Stamens frequently 6, sometimes more. Stigmas more or less elongated; fruit with a small embryo and a long linear hilum.

A. *Spikelets unisexual; plants monœcious; anthers* 6 *or more.*

I. Spikelets in short, solitary spikes, terminal and axillary .... HYDROCHLOA, 40
II. Spikelets in panicles, not in pairs at the nodes of the panicle, without empty glumes.
  * Female spikelets ovate or elliptical; embryo many times longer than the fruit.
    ← Male and female spikelets in different panicles, rarely in the same, and then the male spikelets terminal on each branch ..... LUZIOLA, 40
    ⇇ Male and female spikelets in the same panicle, the female terminal, the male at the base of each branch ..... ZIZANIOPSIS, 41
II. Spikelets linear; embryo as long as the fruit; the upper branches female, the lower male ..... ZIZANIA, 41

B. *Spikelets all perfect; arranged in panicles.*

I. Empty glumes 2, short but distinct, awnless; flowering glume and palet much compressed laterally ..... ORYZA, 41
II. Empty glumes wanting or only minute rudiments; flowering glumes awnless ..... LEERSIA, 41

6. Tribe PHALARIDEÆ.

Spikelets with 1 perfect terminal flower, with the addition of 2 male or imperfect ones, or 1 or 2 sterile glumes or pedicels below the perfect flower and above the lower pair of empty glumes. Rachilla not prolonged beyond the fertile flower. Palet or its substitute, with a central nerve or none, laterally compressed.

A. A pair of small glumes or bracts, 1 on each side of the perfect flower. PHALARIS, 42
B. Perfect flower small; on each side an awned empty glume, which is larger than the perfect flower ..... ANTHOXANTHUM, 43
C. Third and fourth glumes, or at least the third, with a male flower almost equaling the first and second, awnless or short awned ..... HIEROCHLOE, 43

7. Tribe AGROSTIDEÆ.

Spikelets 1-flowered, sometimes with a rachilla or rudiment of a second flower, very rarely 2-flowered; empty glumes 2, very rarely wanting, usually as long as, or sometimes shorter, or even longer than the floral glumes; palet 2-nerved.

(1) Subtribe STIPEÆ.

Flowering glume indurated at maturity or at least firmer in texture than the empty glumes, very closely inclosing the flowers and fruit, and (except in Milium) with a simple or trifid awn from the apex, and (except in Milium) with a callus at the base.

(1) Awn usually trifid, the branches divaricate.....ARISTIDA, 44
(2) Awn simple, twisted; callus mostly acute.....STIPA, 49
(3) Awn simple, straight, deciduous; callus short, obtuse.....ORYZOPSIS, 55
(4) Awn wanting; flowering glume without a callus.....MILIUM, 56

(2) Subtribe EUAGROSTEÆ.

Glumes membranaceous, the lower rarely strongly conduplicate, the floral one with or without a dorsal awn; sometimes with a minute or conspicuous rudiment.

(1) Spikelets strongly conduplicate; palet 1-nerved; stamen 1; sometimes with a rudiment.....CINNA, 57
(2) Flowering glume 1- (rarely 3-) nerved; grain loosely inclosed or naked; no rudiment.....SPOROBOLUS, 59
(3) Empty glumes long-awned; no rudiment.....POLYPOGON, 57
(4) Empty glumes chartaceous and hairy; flowering glume strongly awned under the apex; rudiment present.....THURBERIA, 58
(5) Flowers large, spicate or closely panicled; not awned.....EPICAMPES, 58
(6) Flowers large, panicle contracted; Arctic grasses.....ARCTAGROSTIS, 59
(7) Floral glume mucronate or awned from the apex; no rudiment.
MUHLENBERGIA, 64
(8) Empty glumes minute; floral glume large and with a short awn; rachilla much prolonged and terminated by a minute rudiment.....BRACHYELYTRUM, 71
(9) Empty glumes longer than the floral glume; rarely with a minute rudiment.....AGROSTIS, 72
(10) Floral glume with a delicate awn below the apex, many times longer than the glume.....APERA, 78
(11) Empty glumes saccate at the base, many times longer than the floral glume.....GASTRIDIUM, 78
(12) Flowers generally with many fine hairs from the callus at the base and with a hairy rudiment; the floral glume and palet (except in section Calamovilfa) thin and membranaceous.....CALAMAGROSTIS, 78
(13) Floral glume and palet chartaceous; floral glume awnless; panicle spikelike.....AMMOPHILA, 85

(3) Subtribe PHLEOIDEÆ.

Flowering glume usually hyaline or membranaceous at maturity, at least more delicate than the empty glumes; grain loosely or not at all inclosed.

A. Spikelets in a spikelike panicle.
I. Awns none; spikes short and scarcely exserted.....HELEOCHLOA, 85
II. Glumes somewhat truncate, mucronate, or short-awned, spike cylindric.
PHLEUM, 86
III. Empty glumes united at the base, the floral one awned on the back; palet none; spike cylindric.....ALOPECURUS, 86
IV. Lower glumes with 2 awnlike teeth, the upper with 1.....LYCURUS, 88
B. Spikelets minute; empty glumes wanting, the floral usually deciduous.
COLEANTHUS, 88
C. Spikelets in a narrow panicle; empty glume short.....PHIPPSIA, 89

TRIPSACUM Linn.

Flowers monœcious in jointed spikes, the upper part male and the lower female. The upper or male spikelets sessile, in pairs at each joint of the triangular rachis; each spikelet with 2 membranaceous male

flowers, the outer glumes coriaceous or rigid. The pistillate spikelets single and embedded in the joints of the thickened cartilaginous rachis, 2-flowered, the upper flower fertile, the lower neutral; the outer empty glume thickened and cartilaginous, the inner much thinner and pointed; the flowering glumes and palets thin and scarious.

At maturity the rachis breaks up at the joints with the embedded spikelets.

1. **Tripsacum dactyloides** Linn. (GAMA GRASS). (Gray's Manual, 6th ed., p. 636.) Culms tufted, 4 to 6 feet high, thick and stout; leaves coarse, 1 to 2 feet long, 1 inch wide; spikes 2 to 4 together at the apex, and sometimes 1 or 2 lateral ones, 4 to 8 inches long, rigid, the lower one-fourth pistillate, the upper staminate; spikelets 4 to 5 lines long, as long as or longer than the internodes.—In rich low ground, Connecticut to Missouri and southward to Florida and Texas.

Var. MONOSTACHYUM (T. *monostachyum* Willd). Culms 1 to 2½ feet high; cauline leaves short (5 to 8 inches), one-half inch wide, long-attenuated at apex; spike single, terminal, 4 to 6 inches long; spikelets nearly as in T. *dactyloides*, the pistillate part consisting of about 8 joints.—Connecticut to Missouri and southward to Florida and Texas. *G. C. Nealley* in Texas (Ballinger County ?).

2. **T. Floridanum** Porter in Herb. Culms 2 to 4 feet high, slender, leaves 2 feet long, narrow and rigid; spike single, terminal, 6 to 10 inches long, stiffly erect, more slender than the preceding; spikelets smaller and more numerous, two-ranked, the pistillate part short.—Florida (*A. P. Garber*) and Texas (*G. C. Nealley*).

3. **Lemmoni** Vasey. Culms 4 to 5 feet high, less robust than in *T. dactyloides*, the leaves longer, narrower, and more rigid, becoming somewhat involute, scabrous on the margins, otherwise smooth; spikelets terminal and lateral, the upper in clusters of 5, the lateral in pairs or single, the male part 3 to 3½ inches long, the female part 2½ to 3 inches; the male part slender, the spikelets 3 lines long; the female part about 2 lines wide, somewhat flattened or angular, of 12 to 15 joints, each about 2 lines long.—Huachuca Mountains, Arizona (*J. G. Lemmon*).

This species is near *T. fasciculatum* Trin., of Mexico, but is less robust, with much narrower leaves. That also has much laxer and longer male spikes, its spikelets 2 lines long; the female spikelets shorter.

COIX Linn.

Culm repeatedly branched, the branches ending in an inflorescence, which consists of (at the base) one or two globose ivory-like capsules with an orifice at the top from which projects a number of male spikelets in pairs. The globose capsule with one or two sterile spikelets. The capsule is formed by a condensation of the sheath of the leaf at the base of the female inflorescence.

The species *C. lachryma* is occasionally cultivated in this country, and is occasionally found escaped from cultivation. It is called Job's tears, and is originally from China and India.

ELIONURUS H. B. K.

Spike cylindrical, rachis grooved, white-hairy, the sessile spikelet with one perfect flower, the pediceled one sterile. Glumes 4, all awnless, the lower one usually the largest and thickest, keeled near the margin on each side, and with a row of balsam cells under each keel, second rather smaller and thinner, the third and fourth hyaline. Stamens 3. Styles distant, stigmas plumose.

1. **E. tripsacoides** H. B. K. (*Andropogon Nuttalli* Chapm.; *Rottbœlia ciliata* Nutt.) (Chapm., Flora S. U. States, p. 580.) Culms 3 to 4 feet high, stout, erect, smooth; leaves linear, smooth; spikes terminal and lateral, 3 to 5 inches long, on long peduncles; rachis and pedicel of sterile flower white-ciliate; outer glumes hispid-ciliate near the margin.—Florida to Texas and Mexico.

2. **E. barbiculmis** Hack. (*Andropogon candidus* Torr. in Herb.) (Vasey, Grasses of the Southwest, Pl. 15.) Culms 2 to 3 feet high, white-ciliate at the nodes, pubescent below, more slender than the preceding; radical leaves numerous, almost capillary, about half as long as the culm, ciliate-margined; spikes mostly terminal, 3 to 4 inches long; rachis, pedicels, and first and second glumes white villous.—Texas, Arizona and Mexico.

ROTTBŒLLIA Linn. f.

Culms erect, spikes terminal, or terminal and lateral, cylindrical or slightly compressed, joints of the rachis and pedicels thickened, first or outer empty glume coriaceous, covering the excavation in the rachis, joints of rachis and spikelet usually naked.

(a) Joints of rachis readily disarticulating.

1. **R. cylindrica** Chapm. (*Tripsacum cylindricum* Michx.) (Chapm. Fl. S. States, p. 579.) Culms slender, terete, 1 to 2 feet high; leaves narrowly linear; spikes mostly terminal and curved, 2 to 6 inches long, 1 line in diameter, purplish; spikelets as long as the internode; lower glume obtuse, obscurely pitted, sterile spikelet rudimentary.—Florida to Texas.

2. **R. rugosa** Nutt. (Chapm. Fl. S. States, p. 579.) Culms compressed, 2 to 4 feet high, smooth; leaves long, linear spikes numerous (5 to 15), mostly on long pedicels 2 to 6 inches long; spikelets sessile, about equaling the joints; lower empty glume transversely rugose and sometimes reticulated.—Delaware, Florida to Texas.

3. **R. corrugata** Baldw. (Chapm. Fl. S. States, p. 579.) Peduncles mostly single, elongated; spikes slightly compressed, erect; spikelets longer than the joint.—Southern States, near the coast.

Var. AREOLATA Hack.—Alabama (*Dr. Charles Mohr*).

(b) Joints of rachis persistent or tardily disjointing.

4. **R. fasciculata** Lam. Ill. I. 204. (*Hemarthria fasciculata* Kth.) Culms angular or compressed, 2 to 3 feet high; leaves short; spikes mostly fassicled, 2 to 4 inches long, compressed, not rigid, from numerous lateral branches; pedicel of the staminate spikelet adnate to the rachis.—Southwestern Texas (*Havard, Nealley*).

MANISURIS Swartz.

Spikelets small, in pairs; the sessile or perfect spikelet 1-flowered, globose, inflated, pitted externally; the pedicellate spikelets flat, male or empty, their pedicels grown to the rachis.

1. **M. granularis** Swartz. (Chapm. Fl. S. States, p. 580.) Culms 1 to 2½ feet high; much branched below; leaves 1 to 4 inches long, the sheaths pubescent or scabrous, inflated, blade ciliate on the margins; spikes numerous, lateral and terminal, about 1 inch long, closely flowered; spikelets less than 1 line long.—Florida to Texas and Mexico, near the coast.

TRACHYPOGON Nees.

Spikes or spikelike raceme solitary and terminal. Axis of the spikes indistinctly articulate, not brittle, the male spikelet very short-pediceled, awnless; fertile spikelet longer-pediceled, and with a long twisted and bent awn.

1. **T. polymorphus** Hack. (Vasey, Grasses of the Southwest, Pl. 17.) Perennial; culms 2 to 4 feet high; leaves flat, 3 to 6 inches long; spikes 3 to 6 inches long, rather loosely flowered, sometimes one-sided; spikelets 3 lines long, pubescent; outer glume lance-oblong, obtuse, 7-nerved; awn 1½ to 2 inches long.—Texas to Arizona and New Mexico.

HETEROPOGON Pers.

Spike densely flowered, appearing one-sided. The sessile spikelets awned fertile, cylindrical; the pediceled spikelets male, imbricated and obliquely bent to one side of the spike, awnless. Glumes in the perfect flower 4, the outer one hard and convolute, the second softer, keeled, the third thin and hyaline, the fourth, hyaline at the base, above terminating in a hard, twisted, and bent awn.

1. **H. contortus** R. & S. (*Andropogon contortus* Linn.) (Vasey, Grasses of the Southwest, Pl. 16.) Perennial, strongly rooted; culm tufted, smooth, branching above, erect, about 3 feet high; leaves 6 to 12 inches long, smooth, sheaths flattened; spike cylindrical, about 2 inches long without the awns; rachis with a tuft of brown hairs at the base of the spikelets; sessile spikelet about 3 lines long, the male one 5 inches, flattish, oblique.—Texas, New Mexico Arizona and in tropical countries.

2. **H. acuminatus** Trin. (*Andropogon melanocarpus* Ell.) (Chapm. Fl. S. States, p. 582.) Culms 4 to 8 feet high; leaves elongated; spikes numerous, approximate, 1-sided, 1 to 2 inches long, shorter than the sheathing bract; spikelets large, the sterile one 6 to 8 lines long, of 3 flattish, nerved, twisted, glumes, the fertile spikelet 2 lines long, rusty bearded; the glumes coriaceous, obtuse; awn 4 inches long.—Florida and westward to Texas and Mexico.

IMPERATA Cyrill.

Inflorescence in a narrow, or spike-like panicle; spikelets in pairs, one sessile, the other pediceled, both perfect, awnless; the 2 outer glumes densely clothed with long silky hairs. Stamens 1 to 2. Stigmas 2.

1. **I. Brasiliensis** Trin. Mem. Acad., Petersb. Ser. 6, II. p. 331. Culms 2 to 3 feet high, simple, rather slender, from long creeping rootstocks; radical leaves broadly linear, 2 feet long, cauline ones few, the lower 6 inches long, blade much reduced or wanting; panicle linear-oblong, 4 to 6 inches long, spikelets 2 lines long.—Florida.

2. **I. Hookeri** Rupr. in Anderson. (*I. brevifolia* Vasey in Bull. Torr. Club XIII. p. 26.) Culms 3 to 4 feet high, from creeping rootstocks, rather stout, simple, smooth; radical leaves 6 to 12 inches long, cauline ones shorter, gradually decreasing upward, ligule short, ciliate; panicle nearly cylindrical, erect, 6 to 12 inches long, sometimes interrupted below, lower branches 1 to 2 inches long, appressed; spikelets little more than 1 line long.—Texas, New Mexico to Southern California and Mexico.

ERIANTHUS Michx.

Inflorescence an ample or narrow panicle; spikelets in pairs, one sessile and one pediceled, both alike fertile and awned. Tall and stout reed-like perennials.

1. **E. saccharoides** Michx. (*E. alopecuroides* Ell.; *Andropogon alopecuroides* Linn.) (Gray's Manual, 6th ed., p. 637.) Culms 4 to 6 feet high, woolly-bearded at the nodes; panicle dense, contracted, 4 to 10 inches long; general rachis woolly; partial rachis woolly-tufted below the spikelets, the hairs longer than the spikelets; awn ½ to 1 inch long, straight; spikelet 2 lines long; outer glumes sparsely hairy; stamens 2.—New Jersey south to Florida and Texas.

2. E. brevibarbis Michx. (Gray's Manual, 6th ed., p. 637.) Culms 3 to 5 feet high; main rachis of panicle pubescent or nearly smooth; panicle more open and the silky hairs usually shorter than the spikelets.—Maryland south to Florida and west to Texas.

E. contortus Ell. seems to differ from the preceding only in a twisted awn, and the difference is hardly sufficient to entitle it to be called a variety.—Same range as preceding.

3. **E. strictus** Baldw. (Chapm. Fl. S. States, p. 583.) Culms 4 to 8 feet high, smooth; leaves 1 to 2 feet long, smooth, or scabrous beneath; panicle narrow and strict, 10 to 15 inches long, no silky hairs; spikelets 4 lines long; the outer glumes scabrous; awns straight, 8 lines long.—Georgia, Florida, Tennessee to Texas.

CHRYSOPOGON Trin.

Panicle open, the branches usually short; spikelets in pairs, sometimes in threes, the outer sessile one fertile, the pediceled ones sterile or reduced to a rudiment; fertile spikelet with 4 glumes, the lower one larger and coriaceous, second narrow, keeled, pointed, the third hyaline, empty, the fourth or flowering glume hyaline, and awned, rarely awnless; palet very small or wanting.

The genus Sorghum Pers. differs from *Chrysopogon* principally in the glumes of the fertile spikelets becoming more hardened after flowering. Prof. Hackel includes the genus under *Andropogon*.

1. **C. nutans** Benth. (INDIAN GRASS, WOOD GRASS.) (Gray's Manual, 6th ed., p. 638.) Root perennial; culms simple, 3 to 6 feet high, smooth; leaves linear-lanceolate, sheaths smooth; panicle narrowly oblong, crowded or loose, erect or nodding, 6 to 12 inches long; fertile spikelets about 3 lines long, lanceolate, yellowish or brownish, sparsely hairy; awn twisted, 6 to 10 lines long; pedicel of the sterile or imperfect spikelet plumose hairy.—Very widely spread, Atlantic to Rocky Mountains and Mexico.

I find no permanent characters to distinguish this from *Andropogon avenaceus* Michx.

2. **C. secundum** Benth. (*Andropogon unilaterale* Hack.; *Sorghum secundum* Chapm. in Fl. S. States.) Culms 2 to 3 feet high; panicle narrow, erect, one-sided, 6 to 12 inches long; glume light brown, very hairy all over, otherwise like *C. nutans*.—Very dry ridges in the pine barrens Georgia and Florida.

3. **C. Wrightii** Munro. (*Sorghum pauciflorum* Chapm. in Fl. S. States, Suppl. p. 668; (*Andropogon pauciflorus* Hack.) Annual; culms branched near the base, 2 to 3 feet high; leaves long, broadly linear, flat, ciliate; spikelets few (6 to 12), racemose; pedicels 2 to 3 inches long, setaceous in whorls of 2 to 6; perfect spikelets 4 lines long, the pediceled ones as long but slender and reduced to 2 glumes; first and second glumes of fertile spikelets equal, linear, 5 to 6 inches long, geniculate, twisted below the middle.—Sandy pine barrens East Florida (*Chapman*).

ANDROPOGON Linn.

Inflorescence in simple or paniculate spikes or spike-like racemes, either solitary, in pairs, digitate, or panicled. Spikelets in pairs in the alternate notches of the rachis, one sessile and fertile, the other pediceled and sterile, (this either male or empty, or reduced to a mere pedicel); fertile spikelet with two, more or less coriaceous outer glumes, a third hyaline empty glume, and the fourth or flowering glume also hyaline and awned; the sterile spikelet similar, but empty or male only, and unawned. Palet small and hyaline or wanting.

Our species of this genus belong to several sub-genera or sections.

§ 1. Schizachyrium.

Racemes slender, solitary, terminal, on long peduncles; the thickened joints of the rachis with a cup or tooth-like appendage at the apex; flowering glume often cleft nearly to the base, awned from between the divisions.

1. **A hirtiflorus** Kth. var. FEENSIS Hack. in DC. Monogr. Phan. VI. 372. Culms 2 to 3 feet high, the upper half giving out lateral branches, smooth; radical leaves narrow, flat or conduplicate, 4 to 6 inches long, acuminate, scabrous, sparsely hairy below; culm leaves similar, the upper sheaths inclosing lateral branches; racemes 4 to 5, about 3 inches long, of 10 to 13 joints; rachis villose; sessile spikelet 5 lines long; first glume linear lanceolate, acuminate, scabrous on the back and sparsely hairy; second glume glabrous; third glume hyaline, one-third shorter than the second, parted nearly to the base, twisted awn between the lobes; fourth glume as long and very narrow.—Arizona and Mexico.

Var. OLIGOSTACHYUS Hack. in DC. Monogr. Phan. VI. p. 372. (*Andropogon oligostachyus* Chapm. Fl. S. States, p. 581.) Racemes 2 to 2½ inches long, with 10 to 15 joints, more slender; joints at apex loosely pilose; first glume entire or minutely 2-toothed, with scattered pubescence.—Middle Florida and Arizona.

2. **A cirrhatus** Hack. in Flora, 1885, p. 119. (Vasey, Grasses of the Southwest, Pl. XVIII.) Culms 2 to 2½ feet high, slender, branching from the upper joints; peduncles 1½ to 3 inches long; leaves 3 to 5 inches long, erect; sheaths smooth; racemes 3 to 5, 1 to 2½ inches long, with about 10 joints, peduncles and rachis smooth or nearly so; sessile spikelet 3 to 3½ lines long, smooth; first glume 7- to 9-nerved; second glume rather shorter, membranaceous, 1-nerved, scabrous on the keel; third and fourth glumes hyaline, the fourth cleft three-fourths to base.

3. **A tener** Kth. (Chapm. Fl. S. States, p. 581.) Culms 2 to 3 feet long, filiform, like the smooth soon involute leaves; spikes slender, terete, 1 to 2 inches long, with the joints bearded at base, otherwise smooth; spikelets appressed, half as long as the bent awn; glumes rough above; pedicel of the awnless neutral flower beaded at the apex.—Georgia, Florida and westward to Texas.

4. **A. scoparius** Michx. (Gray's Manual, 6th ed., p. 637.) Culms 2 to 4 feet high, somewhat compressed, with numerous branches either single or fascicled, sometimes again fasciculately branched, long exserted from the sheaths; spikes slender, 1 to 2 inches long, loosely flowered, often purplish, with 5 to 10 joints; rachis generally zigzag when ripe, and with the sterile pedicels long ciliate above; sessile spikelets 3 to 5 lines long; first glume acute, minutely scabrous, bidentate at apex, obscurely 5-nerved; second glume membranaceous, acute, keeled, scarious and ciliate on margin; third and fourth glumes scarious, fourth with awn 5 to 8 lines long.

Var. MARITIMUS Hack. (A. *maritimus* Chapm.). "Panicle simple, racemose, 4 to 8 inches long; spikes single, 8 to 10 flowered, very silky; spikelets larger in the species, outer glumes twice as long as the stout joints, and half as long as the twisted awn" Chapman. Remarkable for its large glumes.

5. **A. semiberbis** Kth. Enum. I. p. 489. (*Andropogon oligostachyus* Chapm.). Culms rigid, erect, 2 to 3 feet high; leaves linear, smooth, glaucous; spikes 2 to 4 inches long, erect, lower glume pubescent, one-half to one-third as long as the contorted awn; sterile flower neutral, short-awned.—Dry sandy ridges, middle Florida.

This is Dr. Chapman's description of his *A. oligostachys*, which Prof. Hackel refers to *A. semiberbis* var. *pruinosus*.

6. **A. gracilis** Spreng. Sys. I. p. 284. Culms cæspitose, 1 foot to 18 inches high, slender; leaves filiform-setaceous, 2 to 4 inches long; spikes few, terminal and lateral, solitary, 1 to 1½ inches long, the lateral distant on slender peduncles; rachis and pedicels silky-hairy; pedicellate spikelets reduced to a simple awned glume, outer glumes of fertile spikelet acuminate, 2 lines long, the fourth glume shortly bifid, with an awn three to four times its own length.—Florida (No. 236, *Dr. Garber*).

§2. ARTHROLOPHIS.

Racemes mostly in pairs, rarely digitate or panicled, the lateral ones sessile; joints of the rachis not translucent; flowering glume unusually bifid or 2-toothed, the rachis with a leaf-like bract at the first joint below; pediceled spikelet empty, reduced to 1 or 2 glumes.

(a) Sheathing bracts at the base of the spikes and equaling or longer than them.

7. **A. macrourus** Mich. (Gray's Manual, 6th ed., p. 638, Chapm. Fl. S. States, p. 582.) Culms stout, 2 to 4 feet high, much branched, especially at the summit; panicle 4 to 20 inches long, dense, cymose clustered; racemes in pairs, slender, about 1 inch long, 5 to 8 joints; rachis and sterile pedicels clothed with long white hairs; sessile spikelets about 2 lines long, linear; first glume linear, smooth except on the margins, 2-nerved, bidentate; second glume keeled, acute; third and fourth glume scarious; fourth awned; sterile pedicel longer than the perfect flower; stamen 1.

There are in the Southern States several varieties of this species, the principal of which are:

Var. GLAUCOPSIS Ell., with a more slender, fewer-flowered panicle, the leaves and culm smooth and glaucous.

Var. VIRIDIS Chapm., also a more slender, open-panicled form, with leaves narrowly linear, the radical ones equaling or nearly equaling the culm, light green.

Var. CORYMBOSUS Chapm., in which the spikes are heavily clustered in a corymbose form near the top of the culm.

Var. PUMILUS, n. var. Perennial dwarf, tufted; culms 6 to 10 inches high, branching at the base and terminating in a cymose panicle; leaves 3 to 6 inches long, longer than the internodes, smooth, the sheaths inlosing the lateral flowering branches, sparingly hairy at the throat, branches numerous at the upper sheaths, each subdivided, the sheathing bract rather longer than the terminal spikes, which are 1 to 1¼ inches long, and with 10 to 12 spikelets; pedicel slightly hairy below the bract. A remarkable variety, collected in western Texas (*G. C. Nealley*).

8. **A. Virginicus** Linn. (Gray's Manual, 6th ed., p. 638.) (*A. dissitiflorus* Mich.) Culms appressed below, 2 to 4 feet high, slender, much branched, the branches short and erect; leaves long and narrow and with the sheaths mostly smooth; sheathing leaves longer than the lateral branches, which are 2 to 3 inches long and twice or thrice subdivided, each pair of racemes sheathed with a bract longer than themselves; pedicels short, slender; racemes about 1 inch long; rachis flexuous, 8 to 12 jointed, the sterile pedicel and upper part of the joints long hairy; sessile spikelet 1½ lines long, lanceolate, acute, smooth except on the margins; awn 6 to 8 lines long; stamen 1.—Massachusetts to Florida and coastwise to Texas. Var. GLAUCUS Hack., glabrous throughout.—Florida. Var. DEALBATUS Mohr., sheaths and leaves becoming whitish.—Mobile. Var. TETRASTACHYUS Hack., spikes often in fours, lower sheaths, and leaves pubescent or villous.—Alabama to Florida. Var. STENOPHYLLUS Hack., culms shorter, leaves very short.—South Carolina.

9. **A. longiberbis** Hack. in Flora, 1885, p. 131. Culms 2 to 3 feet high, sheaths more or less hairy; leaves linear, 4 to 8 inches long, narrow; spikes in pairs, 1 to 1½ inches long, mostly rather shorter than the bract at the base, rather densely flowered; the rachis and pedicels covered with long white hairs; spikelets 2 lines long, awn 6 to 8 lines long.—Florida (*Dr. Garber*, 1887).

10. **A. Mohrii** Hack., in litt. (*A. Liebmanni*, var. *Mohrii* Hack.) Culms 3 to 4 feet high, robust, leafy; leaves and sheaths villous-pubescent, the lower distichous, blade narrow, 6 to 10 inches long; panicle 1 to 1½ feet long; peduncles mostly in pairs or threes; bract about as long as the spikes or shorter; spikes in clusters of 3 to 7, 1 to 2 inches long; rachis and internodes villose, brownish; awn of perfect flower ½ to 1 inch long.—Florida (No. 3636, *A. H. Curtiss' distribution*), Mobile, Ala. (*Dr Charles Mohr*), and Ocean Springs, Mississippi (*S. M. Tracy*).

(*b*) *Sheathing bracts at some distance below the spikes and exceeded by them.*

11. **A. Elliottii** Chapm. Fl. S. States, p. 581. (*A. clandestinum* Hale.†) Culms 1 to 2 feet high, bearded at the upper joints; leaves and sheaths purplish, hairy; sheaths, particularly the upper ones, inflated, often crowded and imbricated, 3 to 4 inches long; spikes becoming long exserted, in pairs (rarely 3 to 4); the bract distant below the spikes; rachis very slender, hairs long and silvery; awn 3 to 4 times as long as the glumes.—Delaware to Florida and west to Texas.

12. **A. brachystachyus** Chapm. Fl. S. States, Suppl. p. 668. Culms 2 to 4 feet high, compressed, branching from the upper joints, narrowly paniculate; leaves linear, long, not hairy, rough on the margins; spikes very numerous, by pairs, 6 to 8 lines long, 6 to 9 flowered; spikes very small; awn 4 to 6 lines long.—Florida (*Dr. Chapman*).

13. **A. arctatus** Chapm. (Chapm. Fl. S. States, p. 668.) (*A. tetrastachyus* var. *distachyus* Chapm.) Culms single, 2 to 3 feet high, the appressed branches narrowly paniculate; leaves and sheaths shaggy, with long white, mostly deciduous hairs; spikes in pairs, 1 to 1½ inches long, rather stout, closely 15- to 29-flowered; glumes rough, twice as long as the joints of the rachis; hairs of the rachis few and short; stamen 1.—Florida (*Dr. Chapman*).

14. **A. argyræus** Schultes. (*A. argenteus* Ell.: Gray's Manual, 6th ed., p. 637.) Culms, 2 to 3 feet high, smooth, branching; leaves long, linear, 6 to 10 inches long; culm and leaves smooth; branches 1 to 2 from each upper joint, long exserted; spikes in pairs, 3 to 8 inches long; peduncle stout, with dense white silky hairs; joints of the rachis rigid, as long as the hispid, serrate spikelet; stamens, 3; awns, 3 to 4 times longer than the glumes.—Old fields and woods, Maryland to Florida and west to Texas. Var. TENUIS much more slender, leaves narrowly linear, spikes few.—Texas.

15. **A. Cabanisii** Hack., in Flora, 1885, p. 133. Culms, 2 to 3 feet high, slender, branching from the lower one-third to one-half; lower branches solitary or in pairs, primary ones elongated arcuate-spreading, of 1 to 2 glabrous nodes, secondary ones single or none, short; common peduncle densely barbed at the apex, spikes about 2 inches long, spikelets much as in *A. argyræus*.—Pennsylvania to Florida (fide *Hackel*).

§ 3. AMPHILOPHIS.

Racemes digitate or panicled, all pediceled; joints of the rachis and pedicels with a translucent longitudinal median line; flowering glume pedicel like, tapering into an awn.

16. **A. provincialis** Lam. Ency. I. p. 376. (*A. furcatus* Muhl.) Culms 3 to 6 feet high, rigid; the summit and usually some lateral branches terminated by the 2 to 5 approximate, rigid spikes 3 to 4 inches long, 20 to 25 jointed; joints of the rachis and pedicels sparsely ciliate; spikelets 3 to 4 lines long; lower glume lanceolate, rigid, bidentate, firmly scabrous; second glume membranaceous, keeled in the middle; third and fourth scarious; the fourth awned; fifth 1 line long, fimbriate at apex; pediceled spikelet as long as the sessile one; first glume 13- to 15-nerved; the other glumes as in the sessile spikelet except the awn of the fourth glume; stamens 3.—Common east of the Rocky Mountains.

17. **A. Hallii** Hack. (Gray's Manual, 6th ed., p. 638.) (*A. glaucus* Torr.) Culms 3 to 6 feet high, stout, smooth, glaucous; lateral branches exserted and sometimes nearly as long as the main culm; spikes 2 to 5, usually 3, digitate, 2 to 4 inches long, 10 to 15 joints; the rachis and pedicels more or less villose, with white or straw-colored hairs; spikelets 4 to 5 lines long, the pediceled ones usually a little longer than the sessile ones; first glume linear-lanceolate, smooth or glaucous, except near the apex, 9- to 11-nerved, one-fifth longer than the second glume.—Great Plains, from Montana to Mexico.

A. Hallii is generally distinguished from *A. provincialis* by its thicker and more succulent stem and leaves, its glaucous appearance, its usually larger spikes, and flowers which are conspicuously silky-hairy.

Var. FLAVEOLUS Hack. Hairs of the rachis and pedicel straw-colored, a few long hairs also near the apex of the first and second glumes; awn of the fertile flower short, little exserted.

Var. INCANESCENS Hack. Joints of the spikes white, canescent spikelets 5 to 6 lines long; awn of the fertile flower short or wanting.

18. **A. Wrightii** Hack. in Flora 1885, p. 139. Culms 2 to 3 feet high, unbranched, the nodes glaucous and sometimes ciliate; leaves narrow, smooth, 6 to 10 inches long, shorter than the internodes, ligule short, ciliate; common rachis smooth; racemes 3 to 7, somewhat digitate or subfastigiate, 1½ to 2 inches long, conspicuously pedicellate (the lower pedicels sometimes 6 to 8 lines long), 12 to 15 jointed, joints of rachis and sterile pedicels ciliate; spikelets 2½ to 3 lines long, equal; lower glume of fertile spikelet smooth, ciliate near the apex, 7-nerved, the nerves disappearing below the apex; second glume, chartaceous, 3-nerved; third glume hyaline, smooth, obtuse; fourth glume with an awn 6 to 8 lines long; pediceled spikelet male, as long as the sessile one; first glume obtusish, 9-nerved, the upper part ciliate-margined; second glume obtuse, 3-nerved; third glume hyaline, nerveless, smooth, one-third shorter than the first; fourth glume and palet wanting; stamens 3.—Texas to Mexico.

19. **A. saccharoides** Swartz. (*A. laguroides* DC. in part: Gray's Manual, 6th ed., p. 638.) Culms erect or ascending, simple, smooth; nodes smooth or ciliate; leaves numerous, sheaths terete, striate, shorter than the internodes, smooth or hairy at the throat; ligule short, obtuse, blade linear, narrowed to a long setaceous point, rigid, glaucous or glaucescent; panicle 2 to 5 inches long, often 1 to 1½ inches wide, loosely contracted or dense, the upper branches single and nearly sessile, the lower branches generally subdivided; spikes or racemes usually very numerous (30 to 50), sometimes reduced to 10 or 12, 1 to 2 inches long; the joints of rachis and pedicels copiously clothed with long white hairs obscuring the flowers; sessile spikelets 2½ to 3 lines long, the pediceled ones one-third shorter and imperfect; first glume 5- to 7-nerved, obtuse or bidentate at apex, smooth, except sparsely hairy below; third glume hyaline, one-third shorter than the first; fourth glume reduced to a narrow margin of the awn, which is usually 9 to 12 lines long.

Var. BARBINODIS Hack. Culms robust, nodes densely barbate, panicle large and showy.

Var. TORREYANUS Hack. Sheaths and nodes generally smooth.

Var. SUBMUTICUS Vasey. Culms more slender, panicle narrower, spikelets smaller, 1½ lines long; first glume oblong lanceolate, bidentate, 5-nerved, awn about 4 lines long, or almost wanting.—Southern Kansas, Colorado, Texas, New Mexico and Arizona.

NOTE—The genus SORGHUM Pers. (included by Prof. Hackel in Andropogon) is represented in this country only by cultivated species, first, *S. halapense*, which is commonly called Johnson grass, and is extensively cultivated as a forage plant; and second, *S. vulgare*, including the many varieties cultivated for sugar, fodder, and broom-making.

HILARIA H. B. K.

Inflorescence in terminal spikes; the spikelets in small clusters of three, closely sessile at the joints of the rachis, the central spikelet containing a single fertile flower, either female or perfect, the two lateral spikelets each with two or three male flowers. The outer glumes of the spikelets unlike, mostly thin, rigid, and strongly nerved, some lobed or bifid, dentate or lacerate at the apex, some awnless, and some awned between the lobes. The spikes are sometimes so closely sessile as to require much care to separate them properly.

(a) Cluster not hairy at the base.

1. H. cenchroides H. B. K. *var.* TEXANA Vasey Contr. Nat. Herb. I. 53. Perennial, low, tufted, multiplying by shoots or runners from the base, forming new tufts at intervals of 3 to 6 inches. Flowering culms 6 to 12 inches high, slender, nodes ciliate; leaves small, rigid, 1 to 3 inches long, becoming involute, ciliate on the margins; spike of 5 to 8 joints, slender, clusters loosely, imbricated; spikelets about 3 lines long, connate at base, the male ones each 2-flowered, the fertile one pistillate only; glumes of the fertile flower awned on the back above the middle, the male ones unawned.—Texas to Arizona.

Differs from the type in the taller and more slender culm, longer leaves, longer and more slender spike, with more numerous, looser clusters.

(b) Clusters densely hairy at the base.

2. H. mutica Benth. (Buckl. Proc. Acad. Phil. 1862, p. 95.) Rhizoma creeping, strongly rooted; culms tufted, ascending at the base, 1 to 2 feet high, leafy; leaves rigid, erect, 2 to 3 inches long, acuminate, scabrous, lower sheaths longer than the internodes, ciliate at the throat; spike cylindrical, 2 to 3 inches long; clusters 3 to 4 lines long; two lateral spikelets, each 2- to 3-flowered, the empty glumes cuneate, ciliate on margins and fimbriate at apex, unawned; empty glumes of central spikelet shorter than its flower, narrowly cuneate, laciniate at apex, with a short spreading awn near the apex; the thin glumes of the male spikelets spreading or often reflexed at maturity.—Texas and Arizona.

3. H. Jamesii Benth. (Coult. Rocky Mt. Fl. p. 405.) Rhizome creeping, strongly rooted; culms tufted, 6 to 18 inches high, leafy below; leaves rigid, 2 to 4 inches long, the lowest with loose, large sheaths; spike about 2 inches long, wider than the preceding; clusters 4 to 5 lines long; male spikelets 2-flowered, the empty glumes linear-lanceolate, 5-nerved, ciliate on the margins, the outer with an awn from the back about the middle, longer than the spikelet, the inner one unawned; the female spikelet with the empty glumes ciliate on the margin, cuneate below, above 2-lobed and laciniate into 5 to 7 slender teeth, and awned between the lobes.—Texas, New Mexico and Colorado.

4. H. rigida Scribn. (*Pleuraphis rigida* Thurber Bot. Cal. II. p. 293.) Perennial; culms 2 to 3 feet high, solid, and almost woody below, much branched, clothed within the sheaths with a dense matted tomentum; the lower leaves pubescent, particularly on the lower surface, 4 to 5 inches long, the uppermost about 1 inch, very rigid, becoming involute, setaceously pointed; sheaths crowded below, loose, pubescent; panicle 3 to 4 inches long, dense, pale or purplish; outer glumes cuneate at base, bifid above, woolly-fringed, 3- to 5-nerved, the central nerves excurrent just below the middle as a stout divergent awn a little exceeding the glume, the two or three lateral nerves produced as setæ between the lobes and about equalling them; the floret stipitate; the flowering glume broad, oblong, 3-nerved, irregularly toothed and fringed above, with a short central awn, palet equalling or slightly exceeding its glume; outer glumes of the lateral spikelets similar to those of the central one; one or more of the nerves excurrent as awns, the flowering glume and palets of the two male flowers similar to those of the fertile one.—The most valuable grass of the desert regions in Arizona and Southern California.

This description is, with little alteration, from Prof. Thurber, in Bot. California.

ÆGOPOGON H. & B.

Inflorescence in loose, one-sided terminal and lateral spikes or racemes; the spikelets 1-flowered, in clusters of two or three, one usually sterile or male only. The outer glumes are cuneate, emarginate

or 3-toothed, shorter than the flowering glumes, the latter 3-toothed, with the middle tooth awned; the palet 2-nerved and 2-awned. Stamens 3. Styles 3.

1. **Æ. geminiflorus** H. B. K. Culms much branched, 6 to 8 inches high, weak and decumbent below; leaves linear, plane, 1 to 2 inches long; racemes 2 inches long, somewhat secund, lax; spikelets in twos or threes, 1 to 1½ lines long without the awns; empty glumes less than 1 line long, cuneate, the midrib excurrent in a straight awn about 1 line long; floral glumes half longer than the empty ones, lanceolate-oblong, 3-nerved, 3-toothed, the middle tooth extended into an awn two or three times as long as its glume; palet 2-nerved, 2-toothed.—Huachuca Mountains Arizona (*Lemmon*) and also in Mexico.

TRAGUS Hall.

Flowers in rather loose terminal spikes, the spikelets in clusters of 2 to 5, mostly 3, imperfect. The perfect spikelets 1-flowered, with dissimilar glumes, the lower one minute and membranaceous, the upper ones concave, subcartilaginous, and beset with stout, short hooks; the flowering glume firmly membranaceous and acute; the palet shorter and thinner, 2-nerved. Stamens 3. Styles distinct.

1. **T. racemosus** Hall. (Vasey, Grasses of the Southwest, Pl. 14.) Culms much branched at base, slender, 6 to 18 inches high, leafy, decumbent below; leaves 1 to 2 inches long, ciliate, serrate on the margins; sheaths loose and striate, shorter than the internodes; spike 2 to 4 inches long, narrow, densely flowered, the spikelets about 1 line long.—Introduced and abundantly naturalized near the Gulf of Mexico.

REIMARIA Flügge.

Spikelets acuminate, in unilateral subsessile spikes, with one perfect terminal flower and one exterior empty glume, membranaceous, 3- to 5-nerved, acute, about equaling the fertile glume; fertile glume and palet indurated or membranaceous, finely punctulate. Stamens 2. Styles 2, distinct to the base. Stigmas long and plumose. Culms ascending, diffusely branched at base.

1. **R. oligostachya** Munro. (Chapm. Fl. S. States, Suppl. p. 665.) Culms 1 to 2 feet high, procumbent and rooting at the lower joints, smooth, leafy; sheaths about equaling the internodes; leaves plane or becoming convolute, narrowly linear, acuminate; upper sheaths usually inclosing the base of the 2 to 3 approximate, erect or divergent spikes about 2 inches long and 10- to 20-flowered.—Florida, in ditches and shallow water; probably also to be found on the Gulf coast westward.

This species varies from the character of the genus in usually having a second outer glume either fully or imperfectly developed in a portion of the spikelets of each spike.

R. acuta occurs in Cuba, and will probably also be found in southern Florida.

PASPALUM Linn.

Spikelets obtuse or rarely short-acuminate, each with one terminal perfect flower, in one or two rows along one side of the slender solitary or paniculate flattened spikes. Glumes 3, the outer ones membranaceous, equal, or in a few species the outer one smaller or disappearing; the flowering glume more or less concave, becoming indurated, embracing

the shorter palet of the same texture. Stamens 3. Styles 2, distinct to the base. Stigmas plumose. Spikes simple, terminal, or subdigitate or approximate or scattered along the general peduncle, spreading or reflexed.

§ 1. ANASTROPHUS Benth.

Spikelets rather distichous than secund, with the back of the flowering glume turned outwards or away from the rachis.

1. **P. platycaule** Poir. (Vasey in Bull. Torr. Club, XII. 162.) Culms very slender, 6 to 18 inches high, from a creeping rhizome; peduncle long, exserted, terminated by a pair of spikes (1 to 2 inches long), or 3 or 4 approximate slender spikes, and frequently with several long peduncled lateral ones; spikelets single, elliptical-oblong, acutish or obtuse, outer glumes little longer than the flower, generally only 2-nerved; leaves narrowly linear, smooth, obtuse, the sheaths much compressed.—Damp ground; Florida to Texas.

2. **P. furcatum** Flugge. (*P. Digitaria* Chapm. non Poir.; *P. Elliottii* Wats. (Gray's Manual, 6th ed., p. 629); *P. Michauxanum* Kth.) Culms ascending from a creeping and branching base, 1 to 2 feet high; leaves lanceolate, obtuse, or rather acute, 3 to 6 inches long, 3 to 6 lines wide, smooth or hairy; spikes mostly in pairs from slender, elongated peduncles (often 2 to 3 together from the upper sheath), slender, 3 to 4 inches long; spikelets about 2 lines long, lanceolate, acute; empty glumes, 5- to 7-nerved, one-third longer than the obtuse flower.—Wet ground, North Carolina to Florida and Texas.

Var. VILLOSUM; leaves and sheaths very villous.

3. **P. compressum** Nees. Mart. Bras. II. p. 23. Culms decumbent and creeping, stout, about 1 foot high, nodes 2 or 3, ciliate-woolly; lower leaves 6 inches long, 4 to 6 lines wide, obtusish, 13-nerved, finely ciliate on the margins, upper ones 1 to 2 inches long; sheaths compressed, loose; spikes 3, approximate, 3 to 4 inches long; spikelets ovate, about 1 line long, acute, the empty glumes sparsely pubescent, a little longer than the obtuse flowering glume.—Manatee, Fla. (*J. H. Simpson*). This species is intermediate between *P. platycaule* and *P. furcatum*. It has none of the subradical spikes of the first.

§ 2. EUPASPALUM Benth.

Spikelets more or less secund along the rachis, with the back of the flowering glume turned inward or toward the rachis.

(1) Subsection *Pseudoceresia* Benth.

Rachis of the spikes membranaceous, dilated, and applied close to and nearly inclosing the flowers when mature.

4. **P. fluitans** Kunth. (Gray's Manual, 6th ed., p. 628.) Culms decumbent and creeping, 1 to 3 feet long, smooth; leaves from 2 to 6 inches long, 4 to 8 lines wide, scabrous; panicle 3 to 6 inches long, formed of numerous (20 to 50) linear spikes, becoming spreading or sometimes reflexed, the lower ones often fascicled, the others scattered; rachis wider than the spikelets, acute, the point extending beyond the spikelets; spikelets small (one-half to two-thirds of a line long), oblong, acute, whitish; empty glumes pointed, thin, without a midrib, sparsely hairy; fertile flower a little shorter than the empty glumes.—On muddy shores, and floating in water, Maryland to Louisiana and Texas.

5. **P. Walterianum** Schultes. (Chapm. Fl. S. States, p. 570.) Culms decumbent and creeping, smooth, much branched, 1 to 2 feet long; leaves linear, short (1 to 2 inches); sheaths mostly longer than the internodes; spikes 3 to 7, usually 3 or 4, approximate or becoming somewhat distant, the lowest included in the uppermost sheath, 1 to 1½ inches long, smooth, ovate, rather obtuse; glumes, 5-nerved.—Maryland; southward and westward to Louisiana.

(2) Subsection *Opisthion* Benth.

Rachis of spikes flat, not dilated.

(*a*) *Spikes digitate, in terminal pairs, or rarely* 3 *or* 4.

6. **P. conjugatum** Berg. (Chapm. Fl. S. States, Suppl., p. 666.) Culms decumbent and branching at base, 1 to 2 feet high, slender, smooth; leaves flat, thin, 2 to 3 inches long, gradually pointed; sheaths compressed, spikes 2, conjugate, divergent (rarely with a third), 2½ to 3 inches long; spikelets in 2 rows, one-half line long, roundish ovate, ciliate on the margins, empty glumes very thin, 2-nerved, the middle nerve wanting.—Louisiana and Mississippi.

7. **P. notatum** Flugge. (Vasey in Bull. Torr. Club, XIII. 163. Rhizome creeping; culm simple, erect or ascending; leaves lanceolate-acuminate, flat, 4 lines wide, lower 6 inches long; sheaths compressed; spikes 2, 2 to 3 inches long, in 2 series, ovate, smooth, obtusish, empty glumes 3- to 5-nerved.—Introduced on ballast ground, Philadelphia.

8. **P. dichotomum** Linn. (Gray's Manual, 6th ed., p. 629.) Culms decumbent and rooting, becoming erect, 1 to 1½ feet high; leaves flat, 2 to 5 inches long, smooth; sparsely pubescent; spikes 2, rarely 3, 1½ to 2½ inches long; spikelets in 2 rows, ovate, acutish, empty glumes 3-nerved, smooth or sparsely hairy, 1 line long or a little more.—Low or sandy grounds, Southern States, westward to California.

9. **P. vaginatum** Swartz. (Chapm. Fl. S. States, p. 570.) (*P. reimarioides* Chapm.) Stems widely rooting, the ascending branches varying from short and entirely covered with the leaf sheaths to slenderer and 1 foot long, with the leaves distant; leaves rarely flat, mostly involute and almost subulate; the sheaths loose and large; spikes 2 to 4, 1 to 2 inches long; spikelets in 2 rows, ovate-lanceolate, acute or acuminate, 1½ lines long or more, empty glumes 3-nerved.—In ditches and wet ground, Florida near the Gulf coast.

It is difficult to distinguish some forms of this from the preceding species.

(*b*) *Spikes single and terminal, or one terminal and one (rarely more) additional, approximate, with sometimes axillary peduncled ones.*

10. **P. monostachyum** Vasey. Chapm. Fl. S. States, Suppl., p. 665. Culms erect, stout, rigid, smooth, 2 to 3 feet, the upper joint very long; lower sheaths inflated, longer than the internodes, ligule short, obtuse, blade elongated (the lower 1 foot or more), convolute, rigid; spike 6 to 8 inches long, erect, the spikelets imbricate, about 1½ lines long, smooth; first glume 3-nerved, rather shorter than the spikelet, second glume equaling the flowering one; occasionally with a long peduncled axillary spike, and sometimes the spikelets with a third small sterile glume.—Southern Flora (*Dr. Garber*) and Texas (*G. C. Nealley*).

Differs from *P. rectum* Nees. in its much stouter culm and leaves, and twice as long a spike.

11. **P. setaceum** Michx. (Gray's Manual, 6th ed., p. 628.) (*P. debile* and *P. ciliatifolium* Michx.) Culms decumbent or erect, 1 to 2 feet high, slender; leaves 2 to 6 inches long, variable in width, smooth or pubescent; sheaths generally hairy; spikes slender, the terminal one long-peduncled, 2 to 4 inches long; rachis narrow; spikelets in pairs in two rows, shortly pediceled, about three-fourths line, ovate, obtuse, smooth, or pubescent.—Widespread, New England to Florida, westward to Texas and Mexico. Var. CILIATIFOLIUM (*P. ciliatifolium*, *P. dasyphyllum* Ell.) Culms stouter and taller, leaves 4 to 6 lines wide, hairy on the margins or all over; spikelets larger, smooth or pubescent, and in one form grandular.—Maryland to Florida and Texas.

(c) *Spikes 2 to 5, rarely more, not digitate.*

* *Spikelets 1 line long or less.*

12. **P. cæspitosum**, Flügge. (Vasey in Bull. Torr. Club, XIII. 164.) Culms cæspitose, 1 to 1½ feet high, slender; leaves flat, the lower ones 3 to 6 inches long, three-fourths line wide, smooth, sparsely ciliate at the base, upper sheaths very long; spikes 3 to 4, 1 to 2 inches long, at intervals of about 1 inch; rachis very narrow; spikelets very small (one-half to three-fourths line), elliptical, smooth, puberulent, or glandular, irregularly in 3 rows, in pairs, one pedicelled; empty glumes 3- to 5-nerved.—Florida (*A. H. Curtiss*).

14. **P. Drummondii.** (*Dimorphostachys Drummondii* Fourn.; *P. lentiginosum* Presl.? Vasey in Bull. Torr. Club, XIII. 164.) Culms 2 to 4 feet high, branching below, smooth; leaves 6 to 10 inches long, 3 to 5 lines wide; panicle terminal, sometimes with lateral branches; spikes 3 to 4, arcuate, 3 to 4 inches long, rather slender; spikelet in 2 or 3 rows, rather lax, 1 line long, oval, pubescent and granular spotted, generally with a small lower glume, as in Panicum. Intermediate between *P. setaceum* and *P. lævе*.—Florida (*J. H. Simpson*) and Texas (*G. C. Nealley*, No. 350 *Drummond*).

* * *Spikelets from 1 to 1½ lines long.*

15. **P. elatum** Richard. (Vasey in Bull. Torr. Club, XII. 167.) Culm erect, subcompressed, striate, glabrous; sheaths and leaves glabrous, the leaves linear, elongated, narrowly acuminate, scabrous at least above; ligule membranaceous, short; axis of panicle, scabrous; spikes 5 to 7, subfasciculate, sessile, approximate, erect or subfalcate, elongated; spikelets in twos, short-pediceled, narrowly obovate, twice as wide as the axis; glumes obovate, 5-nerved, smooth; valves longitudinally punctulate, striate.

This description is from Doell's Gramineæ Brasiliensis. A specimen with this name from Florida is in Gray Herb.

16. **P. lividum** Trin. (Vasey, Bull. Torr. Club, XIII. 164.) Culms 2 to 2½ feet high, smooth, simple; leaves long and narrow, smooth, sheaths compressed; spikes 4 to 5, ½ inch to 1 inch distant, 1 to 1¼ inches long, erect; spikelets compressed oval or ovate, acutish, smooth, in 3 or 4 rows, imbricated, sometimes pale, sometimes purplish.—Texas (*Nealley* 807, *E. Hall*.)

17. **P. Buckleyanum** Vasey. Bull. Torr. Club, XIII. 167. Culms 3 feet high, firm (not robust), smooth, pale green; leaves elongated, complanate, narrow (2 lines), smooth; spikes 3 to 6, 1 to 1½ inches distant, 1 to 1½ inches long; rachis straight, narrow; spikelets in pairs, in three or four rows, imbricated, about 1½ lines long, lance-ovate, acute, sparsely pubescent, slightly longer than the obtuse flower.—Texas (*Buckley*).

18. **P. lævе** Michx. (Gray's Manual, 6th ed., p. 628.) Culms erect, sometimes decumbent at base, rather slender, 2 to 4 feet high; leaves variable in width and length, smooth, or the sheaths sometimes pubescent; spikes 2 to 6, usually 3 or 4, about 1 inch apart, spreading, somewhat hairy in the axil, 2 to 5 inches long; rachis narrow and flexuous; spikelets in 2 rows, about 1¼ to 1½ lines long, smooth, roundish; empty glumes 5-nerved.—Massachusetts to Texas.

Var. BREVIFOLIUM, leaves 4 to 6 inches long, 4 to 6 lines wide. (*P. undulosum* Le Conte.)

Var. ANGUSTIFOLIUM, tall; lower leaves a foot or more long and narrow spikes 4 to 6 inches long. (*P. angustifolium* Le Conte.)

19. **P. præcox** Walt. (Chapm., Fl. S. States, p. 571.) (*P. lentiferum* Lam.?) Culms erect, 2 to 4 feet high, simple; leaves long and narrow, 8 to 12 inches long, 2 to 4 lines wide, smooth or pubescent; spikes 3 to 6, 1 to 1½ inches apart, erect, 1½ to 3 inches long; rachis straight and flat; spikelets in pairs, mostly in three rows, orbicular compressed, about 1½ lines long; empty glumes smooth, 3-nerved.—North Carolina to Texas.

Var. CURTISIANUM (*P. Curtisianum* Steudel.), larger and stouter; spikes 6 to 8; spikelets large; leaves and sheaths hairy.—Florida.

20. **P. pubiflorum** Rupr. (*P. Hallii* Vasey & Scribn., *P. remotum* Remy(?): Vasey in Bull. Torr. Club, XIII. 165.) Culms decumbent and branching below, from strong creeping rootstocks, leafy, 2 to 3 feet high, stout, nodes (especially the lower ones) pubescent; leaves 6 to 9 inches long, 4 to 6 lines wide, scabrous on the margin, acuminate; margin of the sheath ciliate; ligule membranaceous, short; panicle 3 to 4 inches long, of 3 to 6 spikes; spikes 1½ to 3 inches long, firm, dense; rachis broad; spikelets in pairs, in 3 or 4 rows, 1 to 1½ lines long, oblong, obtuse; empty glumes pubescent.—Louisiana to Texas (804 *E. Hall*). A form or variety occurs from Arkansas to Tennessee, which seems to differ only in the smooth glumes of the spikelets.

Var. GLAUCUM Scribn. Another form occurs in Southwestern Texas and Mexico, which has more rigid culms and leaves, is very glaucous, and the spikelets sometimes in 2 rows. (*Dr. Havard & C. G. Pringle.*)

21. **P. plicatulum** Michx. (*P. undulatum* Poir: Chapm. Fl. S. States, p. 571.) Culms 2 to 3 feet high, rather slender; lower leaves long and narrow, smooth; spikes 3 to 5, 1 to 2 inches distant, 1½ to 2 inches long; rachis narrow; spikelets in pairs, mostly in 3 rows, 1 to 1¼ lines long, oblong oroval, obtuse, plano-convex; empty glumes smooth, 3-nerved, the second or flat one becoming plicate or marked with linear elevations on the margins; spikelets becoming brown or blackish.—Florida to Texas.

22. **P. purpurascens** Ell. (Vasey in Bull. Torr. Club, XIII. 167.) (Probably *P. Boscianum* Flügge). Culms decumbent below, becoming somewhat erect, 2 to 3 feet long, glabrous, branching below (often much branched); leaves long (6 to 15 inches), 4 to 6 lines wide, smooth, except on the glabrous margins, the lower sheaths and culms often dark purple; panicle 4 to 6 inches long; spikes 3 to 12, commonly 7 to 9 on the main culm and 3 to 5 on the branches, 2 to 3 inches long; rachis rather wide, smooth; spikelets in pairs, mostly in 4 rows, about 1 line long, roundish, oval, obtuse.—Florida to Alabama.

23. **P. racemulosum** Nutt. (Chapm., Fl. S. States, p. 571.) (*P. Alabamense* Trin.) Culms simple, erect, from strong scaly rootstocks, 2 to 3 feet high; leaves broadly linear, flat, mostly fringed on the margins; sheaths hairy or smoothish, purplish below; spikes, 2 to 4, slender, erect, 3 to 4 inches long; rachis slender, somewhat flexuous; spikelets rather distant and interrupted, singly or in pairs, distinctly pediceled, the pedicel sometimes 3 times as long as the spikelets; spikelets 1½ lines long, oblong or obovate; empty glumes smooth, 5- to 7-nerved.—Dry sandy soil, North Carolina, Florida, and westward to Louisiana.

24. **P. dilatatum** Poir. (Vasey in Bull. Torr. Club, XIII. 166.) (*P. ovatum* Trin.) Culms stout, 3 to 4 feet high; leaves 10 to 12 inches long, 4 lines wide, smooth; spikes 4 to 7, erect or spreading, lax, 2 to 4 inches long; common axis slender; spikelets in 4 rows, 1½ lines long, ovate, acute, pubescent, villous on the margins; empty glumes acute, longer than the fertile flowers.—Virginia to Florida and Texas.

Var. DECUMBENS. Like the preceding, but only 3 to 4 spikes, and the culms decumbent or sometimes prostrate.—Louisiana (*A. B. Langlois*).

25. **P. difforme** Le Conte. (Vasey in Bull. Torr. Club, XIII. 166.) Culms from strong creeping rootstocks, 3 feet high, stout, smooth; leaves rigid, flat, 5 to 6 inches long, 3 to 4 lines wide, somewhat scabrous, smoothish or pubescent; panicle long, naked below, of 2 to 4 spikes, 1 to 2 inches distant; spikes 1½ to 3 inches long, thick, firm; spikelets 1½ lines long in 2 or 3 rows, ovate-oblong, obtuse, smooth; empty glumes 3-nerved.—North Carolina to Florida (3,570 *A. H. Curtiss* distribution.)

Intermediate between *P. læve* and *P. Floridanum*.

26. **P. Floridanum** Michx. (Chapm. Fl. S. States, p. 571.) Culms 3 to 4 feet high, erect, rigid; leaves long (1 to 2 feet), 3 to 6 lines wide, hairy or smooth; spikes 3 to 7, 1 to 2 inches distant, erect, 3 to 5 inches long, thick; rachis rather narrow,

flexuous; spikelets mostly in 3 rows, nearly 2 lines long, broadly oval, obtuse; empty glumes smooth, 3- to 5-nerved. In the type the leaves and sheaths are villous.—North Carolina to Texas and Arkansas.

Var. GLABRATUM Engelm. Leaves and sheaths smooth; same range.

27. **P. giganteum** Baldw. in Bull. Torr. Club, XIII. 166. Culms 4 to 6 feet high, erect, stout; leaves 1 to 2 feet long, three-fourths to 1 inch wide, smooth or sparsely pubescent; spikes 3 to 4, 5 to 8 inches long, spreading and becoming reflexed, in two or three rows; spikelets rarely 2 lines long, oval, smooth; empty glumes 3- to 5-nerved.—Florida (*A. H. Curtiss, Dr. Baldwin*).

Perhaps a large variety of the preceding.

(*d*) *Spikes more numerous, 20 or more.*

28. **P. virgatum** L. var. PUBIFLORUM Vasey. Culms 3 to 5 feet high, stout, smooth, simple; leaves 1 to 1½ feet long, 3 to 4 lines wide, smooth, margins scabrous; sheaths shorter than the internodes (6 to 10 inches long), smooth, ligule short, ciliate; panicle 6 to 9 inches long, of twenty or more appressed spikes, mostly alternate or some of the lower fasciculate in twos or threes, the lower 3 inches long, rather lax, gradually diminishing upward, crowded near the top; spikelets 1 to 1¼ lines long, compressed ovate, acute, pubescent, and hairy on the margins, in three or four rows; empty glumes acute, 3-nerved, a little longer than the fertile glume.—Texas (*G. C. Nealley*) and Louisiana (*A. B. Langlois*).

ANTHÆNANTIA Beauv.

Spikelets loosely racemose on the slender erect branches of the lax, contracted panicle, containing one perfect terminal flower and one male or neuter one; the outer, empty glumes, hairy, 5-nerved, equal, as long as or longer than the flower; perfect flower, with rigid, membranaceous glume and palet (the apex soft), the sterile flower of a thin membranaceous palet.

1. **A. villosa** Benth. (*Aulaxanthus ciliatus* Ell.; *Panicum ignoratum* Kth.: Chapm. Fl. S. States, p. 577.) Culms erect, simple, smooth, 2 to 3 feet high; leaves linear-lanceolate, pointed, strongly nerved, fringed on the margins, the lower ones widely speading; panicle racemose; spikelets 2 lines long, obovate; sterile flower with 3 stamens; anthers and stigmas yellow.—Florida, North Carolina to Texas.

2. **A. rufa** Benth. (*Aulaxanthus rufus* Ell.; *Panicum rufum* Kth.: Chapm. Fl. S. States, p. 577.) Culms erect, 2 to 3 feet high, smooth; leaves erect, linear-lanceolate, the lower erect, 1 to 2 feet long; sterile flower neutral; anthers and stigmas purple, otherwise like the preceding; leaves and spikelets often purplish.—Florida to Louisiana and Mississippi.

AMPHICARPUM Kth.

Spikelets of two kinds, those of the simple terminal panicle generally perfect, but infertile; the fertile ones borne singly at the ends of subterranean runner-like pedicels, these much larger than the others. The spikelets 1-flowered; those of the panicle with two nearly equal, smooth, pointed, membranaceous, 5-nerved outer glumes; the flowering glume and palet rigid membranaceous, nearly as long as the outer glumes; the spikelets of the runners with thickened, many-nerved, outer glumes, and the flowering glume and palet indurated.

1. **A. Purshii Kth.** (Gray's Manual, 6th ed., p. 634.) (*Milium amphicarpum* Pursh.) Culms, tufted, erect from fibrous roots, naked above; leaves lanceolate, mostly near the base, rather thin, and with the sheaths clothed with rigid spreading hairs; panicle

strict, narrow, with few elongated, narrow, erect branches; spikelets 2 to 2½ lines long, oblong, nearly sessile; empty glumes nearly equal, 5-nerved; flowering glume oblong, pointed, striate; fertile flowers on long peduncles at the base of culm twice as large as the others; the grain oblong, 2 to 3 lines long.—Pine barrens, New Jersey to Florida.

2. **A. Floridanum.** Chapm., Fl. S. States, p. 572. Culms erect, 1 to 3 feet high, branching at the base, from creeping rootstocks; leaves linear-lanceolate, rigid, smooth, 2 to 5 inches long; sheaths fringed on the margins; panicle strict, narrow, with few, erect branches; spikelets 3 lines long, oblong, acute; empty glumes equal, 5-nerved; flowering glume smooth, striate, acute; fertile flowers much as in the preceding species; the anthers imperfect; grain compressed-globose, pointed, inclosed in the hardened flowering glume and palet.—Banks of the Apalachicola River, Florida.

ERIOCHLOA H. B. K.

Spikelets with a peculiar cup-like or annular swelling of the pedicel just below the base, nearly sessile in one or two rows along one side of the slender branches of single panicle. The spikelets with one perfect flower, or with a second male or neutral one; the outer glumes empty, hairy, nearly equal, membranaceous, acute, or acuminate (awned in one species); the perfect flower somewhat shorter, coriaceous, obtuse, or mucronate pointed; the imperfect flower when present consisting of a very thin palet, with or without stamens.

1. **E. sericea** Munro, MS. Perennial; culms erect, 2 to 2½ feet high, simple, leafy; leaves narrow, 4 to 10 inches long, softly pubescent; sheaths mostly shorter than the internodes; panicle terminal, linear, 6 to 8 inches long, consisting of 6 to 10 sessile, alternate, appressed branches, the lower 1 to 1½ inches long, the spikelets imbricated in 2 rows, each about 2 lines long, 1-flowered, perfect flower oblong-ovate, very short-pointed.—Texas and New Mexico.

2. **E. Lemmoni** Vasey and Scribn. Culms 1½ to 2 feet high, decumbent and much branched below; leaves rather short and wide, 3 to 6 inches long, one-half to three-fourths inch wide, lanceolate, acuminate, pubescent, as are the loose sheaths; terminal and lateral panicles 3 to 4 inches long, compressed, of about 6 simple sessile branches or spikes, spreading horizontally in flower, becoming appressed; branches 1 to 1¼ inches long, loosely flowered; spikelets shortly-pediceled, ovate-lanceolate, acuminate, 2 lines long, spreading nearly at right angles to the rachis; flowering glume one-fourth shorter than the outer, tipped with a short point; sterile flower of 3 stamens.—Arizona, New Mexico and Mexico.

3. **E. punctata** Hamil. (*E. polystachya* H. B. K.?: Kunth Gram. I. 30.) Culms much branched below, 2 feet high, leafy; leaves 6 to 10 inches long, 4 to 6 lines wide; panicles 3 to 4 inches long, of 6 to 10 loosely flowered spikes, contiguous, 1 to 2 inches long; spikelets short-pediceled, about 2 lines long, the empty glumes oblong-lanceolate, sparsely pubescent, the upper short-awned; flowering glume one-third to one-half shorter than the spikelet, oblong, with a short awn-like point.—Southern Kansas to Mexico.

Var. MINOR Vasey. Smaller than the preceding, the leaves narrower, spikes fewer and shorter, the spikelets smaller, the empty glumes acute, the flowering glume proportionally longer.—Texas (No. 2087, *Wright, Nealley*).

4. **E. longifolia** Vasey. (*E. mollis* var. *longifolia* Vasey Bull. Torr. Club. XIII. p. 25.) Culms tufted, erect, 2 to 2½ feet high, slender; leaves very narrow, 1 to 2 lines wide, 10 to 18 inches long, erect, smooth; panicle 4 to 6 inches long, of 5 to 8 nodding, loosely flowered spikes, the lower ones with slender pedicels one-half to three-fourths inch long; spikelets 2 lines long, 2-flowered; empty glumes pubescent, ovate, acuminate; fertile flower with a short awn; sterile flower with a palet and 3 anthers.—South Florida (*A. H. Curtiss*).

5. **E. mollis** Kth. Gram. i. p. 30. (*Panicum molle* Michx.?) Culms stout, 2 to 4 feet high, sometimes branched, leafy; leaves linear-lanceolate, rather rigid, acuminate, smooth, erect, 10 to 18 inches long, 3 to 6 lines wide; sheaths long, smooth, striate; panicle 6 to 12 inches long, with numerous (15 to 20 or more) more or less spreading branches, the lower 2 to 3 inches long; rachis and upper part of stem downy, pubescent; spikelets 2-flowered, 2 to 2½ lines long, acute; the sterile flower with 3 stamens; fertile glume oblong, hardly acute.—South Carolina to Florida (*A. H. Curtiss*).

PANICUM Linn.

Spikelets with one perfect terminal flower, and usually a second one male only or rudimentary. Empty glumes 2 or 3, one smaller than the other, often minute, or rarely wanting. The glume of the perfect flower with its palet usually of a coriaceous texture, and obtuse or obtusish. The second flower when present a thin palet and 3 stamens, or the palet wanting. Inflorescence spicate or paniculate.

§ 1. DIGITARIA Benth.

Panicles of several spikes or spike-like branches, digitate or approximate at the top of the culm; spikelets usually small and in alternate pairs along one side of the flattened rachis, 1 sessile and 1 short-pediceled; empty glumes 2, or sometimes 3, the lower one then being minute.

1. **P. glabrum** Gaudin.
2. **P. sanguinale** Linn.
3. **P. filiforme** Linn.
4. **P. serotinum** Trin.

§ 2. TRICHACHNE Benth.

Spikelets densely silky-hairy, or fringed with long hairs, sessile or short-pediceled, in pairs or clustered along the rachis of the numerous simple, erect, spikes or branches of the panicle, acute; lower glume very minute.

5. **P. leucophæum** H. B. K.
6. **P. lachnanthum** Torr.

§ 3. SUBSPICATA Vasey.

Panicle linear or narrow, the branches short, sessile, erect or appressed, or the apex spicate.

(*a*) *Branches densely flowered.*

7. **P. paspaloides** Pers.
8. **P. Curtisii** Chapm.
9. **P. obtusum** H. B. K.
10. **P. reticulatum** Torr.
11. **P. Texanum** Buckl.

(*b*) *Branches lax flowered.*

12. **P. Chapmani** Vasey.
13. **P. Reverchoni** Vasey.
14. **P. subspicatum** Vasey.
15. **P. stenodes** Griseb.

§ 4. PLATYPHYLLA Vasey.

Panicle of few (3 to 6) simple, mostly sessile, spreading branches; the spikelets sessile in two rows on one side of a flattened rachis, as in *Paspalum*, but with a small lower glume.

16. **P. platyphyllum** Munro.
17. **P. plantagineum** Link.

§ 5. BRACHIARIA Benth.

Branches erect or somewhat spreading, not appressed, mostly approximate and sessile.

18. **P. prostratum** Lam.
19. **P. cæspitosum** Swartz.
20. **P. fuscum** Swartz.
21. **P. grossarium** Linn.

§ 6. POLYSTACHYÆ Benth.

Branches of the panicle numerous, spreading, single or subfasciculate, simple, or with some short branchlets, flowering to the base (except in *P. hians*); spikelets sessile or very short pediceled.

22. **P. barbinode** Trin.
23. **P. gymnocarpon** Ell.
24. **P. repens** Linn.
55. **P. anceps** Michx. (some forms).
25. **P. laxum** Swartz.
26. **P. hians** Ell.

§ 7. EUPANICUM Benth.

Branches of the panicle subdivided, single or fascicled, spreading and usually naked below, with the spikelets pediceled, sometimes long-pediceled.

(*a*) *Panicle small, narrow; branches few, erect, or somewhat spreading.*

27. **P. ciliatissimum** Buckl.
28. **P. Xanthophysum** Gray.
29. **P. pedicellatum** Vasey.
30. **P. depauperatum** Mühl.
31. **P. angustifolium** Ell.

(*b*) *Panicle small but diffuse, oval or oblong.*

32. **P. nitidum** Lam.
33. **P. laxiflorum** Lam.
34. **P. dichotomum** Linn.
35. **P. neuranthum** Griseb.
36. **P. Joorii** Vasey.
37. **P. nudicaule** Vasey.
38. **P. consanguineum** Kth.
39. **P. scoparium** Lam.
40. **P. Wilcoxianum** Vasey.

(*c*) *Panicle larger, oval, or oblong.*

41. **P. sphærocarpon** Ell.
42. **P. microcarpon** Muhl.

43. **P. viscidum** Ell.
44. **P. commutatum** Schultes.
45. **P. clandestinum** Linn.

(*d*) *Panicle larger, oval, or oblong.*

46. **P. latifolium** Linn.
47. **P. scabriusculum** Ell. ? Chapm.

(*e*) *Panicle effuse; branches capillary and much subdivided, except in P. sparsiflorum (P angustifolium Chapm.*

48. **P. capillare** Linn.
49. **P. capillarioides** Vasey.
50. **P. autumnale** Bosc.
51. **P. Hallii** Vasey & Scrib.
52. **P. proliferum** Lam.
53. **P. miliaceum** Linn.
54. **P. verrucosum** Muhl.
55. **P. sparsiflorum.**

(*f*) *Tall grasses, with ample and diffuse panicle.*

56. **P. anceps.** Michx.
57. **P. agrostoides** Muhl.
58. **P. bulbosum** H. B. K. and var. avenaceum.
59. **P. maximum** Jacq.
60. **P. amarum** Ell.
61. **P. virgatum** Linn.
62. **P. Havardii** Vasey.

§ 8. FRUTESCENTES Vasey.

Culms frutescent, spikelets large and turgid, empty glumes loose.

63. **P. divaricatum** Linn.

§ 9. VILLIFLORA Vasey.

Panicle diffuse, spikelets very large, the glumes very silky-villous.

64. **P. Urvilleanum** Kth.

§ 10. ECHINOCHLOA Benth.

Spikelets densely crowded in 3 or 4 rows, along the simple, alternate spikes or branches of the panicle; empty glumes scabrous or hirsute, acute or sometimes long awned.

65. **Panicum colonum** Linn.
66. **Panicum Crus-galli** Linn.

§ 11. HYMENACHNE Benth.

The small very numerous spikelets usually crowded in a long cylindrical spike or confined panicle; outer glumes acuminate, the second twice as long as the fruiting ones, gibbous at the base.

67. **P. gibbum** Ell.

§ 1. DIGITARIA Benth.

1. **P. glabrum** Gaudm. (**Gray's Manual**, 6th ed., p. 630), (*Digitaria humifusa* Pers.) Culms spreading, prostrate or erect, 5 to 12 inches long; leaves 1 to 2 inches long, smooth or pubescent; spikes 2 to 6, spreading, 1 to 2 inches long, approximate; spike-

lets oblong, about 1 line long, obtusish; empty glumes, mostly two (the lower one often wanting), pubescent, both equaling the flower.—In cultivated and waste grounds, less common than the following. Var. MISSISSIPPIENSIS Gattinger. Taller (6 to 20 inches high), spikes longer (1½ to 3½ inches), spikelets acutish.—Vicinity of Nashville, Tenn. (*Dr. Gattinger*).

2. **P. sanguinale** Linn. (CRAB-GRASS). (Gray's Manual, 6th ed., p. 630.) Culm erect or decumbent, usually rooting at the lower joints, leaves and sheaths smooth or hairy, variable in length and breadth; spikes 3 to 10 or 15, spreading, digitate or approximate, 3 to 6 inches long; spikelets oblong-lanceolate, about 1½ lines long, acute, smoothish, pubescent; first glume minute, second half to two-thirds as long as the spikelet, third equaling the spikelet.—Naturalized everywhere.

Var. CILIARE Vasey Proc. Am. Acad. XXIV. p. 80, (*P. ciliare* Retz). Glumes ciliate-fringed.

Var. SIMPSONI Vasey n. var. With the general habit of *P. sanguinale*, but perennial; culms 2 to 3 feet long, from long-rooting rhizomes; spikes about 8, each 5 to 6 inches long; spikelets about 1½ lines long; empty glumes two, equal, smooth, 7-nerved, acuminate.—Manatee, Fla. (*J. H. Simpson*), and Mississippi (*S. M. Tracy*).

3. **P. filiforme** Linn. (Gray's Manual, 6th ed., p. 630), (*Digitaria filiformis* Muhl.) Culms very slender, 1 to 3 feet high, erect, simple, or sparingly branched; leaves narrowly linear, 3 to 10 inches long, erect, somewhat pubescent, and with sheaths hairy; spikes 2 to 8, erect or somewhat spreading, 2 to 6 inches long; spikelets 1 line long or less, oblong, acute; empty glumes two, the lower slightly shorter and the upper equalling the flower.—Sandy or gravelly ground; Maine to Florida and westward.

4. **P. serotinum** Trin. (Chapm. Fl. S. States, Suppl., p. 666), (*Digitaria serotina* Michx.; *D. villosa* Ell.) Perennial, extensively creeping, much branched, making a thick carpet; flowering culms 6 to 10 inches; leaves short, erect, hairy, 1 to 2½ inches long, sheaths villous; spikes 3 to 5, about 2 inches long, narrow; spikelets less than 1 line long, acute; two empty glumes, the first one-quarter to one-third as long, and the second nearly as long, as the spikelet.—North Carolina to Florida and westward.

§ 2. TRICHACHNE Benth.

5. **P. leucophæum** H. B. K. Nov. Gen. I. p. 97. Culms stout, 2 to 4 feet high, erect; leaves broadly linear, 1 foot long, scabrous above, ligule ciliate; panicle racemose, contracted, dense, 6 to 10 inches long; the simple branches numerous, erect, fasciculate, 2 to 4 inches long; spikelets linear-lanceolate, acuminate, about 2 lines long; lower glume minute, second nearly as long as, and the third equalling, the perfect flower, which is linear-lanceolate and mucronate-pointed.—Low, rich ground, South Florida (*Chapman, Curtiss, etc.*).

6. **P. lachnanthum** Torr. Culms rather slender, 2 to 3 feet high; leaves much narrower and shorter, panicle shorter, more slender, with fewer and shorter spikes; spikelets smaller, 1 to 1½ lines long, ovate-lanceolate, the perfect flower ovate-lanceolate, acute and mucronate-pointed—mostly on dry hills, Texas, Arizona and New Mexico.

§ 3. SUBSPICATA Vasey.

7. **P. paspaloides** Pers. (Chapm. Fl. S. States, Suppl., p. 666.) Culms 2 to 3 feet high, decumbent and rooting below, smooth, stout, leafy; leaves narrow, 6 to 10 inches long, becoming somewhat involute, and with the sheaths smooth; panicle 5 to 10 inches long, strict, of 10 to 20 appressed, sessile, simple branches, the lower ones 1 to 1½ inches long, upper gradually shorter; spikelets ovate-oblong, obtusish, smooth, 1 to 1¼ lines long, imbricate in two rows on the narrow axis; the lower glume truncate-obtuse, one-third as long, and second glume two-thirds as long as the spikelets (also thin and obtuse).—In ditches or water, Florida to Texas and Mexico.

8. **P. Curtisii** Chapm. Fl. S. States, p. 573. Culms 3 to 4 feet high, often

rooting at the lower joints; leaves linear-lanceolate, plane, rigid, 6 to 9 inches long, 6 to 9 lines wide, smooth; sheaths smooth or hairy; panicle slender, spike-like, 6 to 8 inches long, of numerous appressed slender, single, or fascicled branches, the lower ones remote; spikelets ovate-lanceolate, acutish, about 1 line long; lower glume acute, keeled, half as long as the spikelet; the second a little shorter than the third, which equals the acutish perfect flower; second and third glumes strongly 3- to 5-nerved, sterile flower triandrous. Closely resembles the preceding.—Ponds and swamps, Florida to Texas.

9. **P. obtusum** H. B. K. (Kunth Gram., II. t. 116.) Culms 1½ to 2 feet high, firm, leafy; sending off long (sometimes 8 to 10 feet) runners from the base; leaves 4 to 6 inches long, 2 to 3 lines wide; panicle 3 or 4 inches long, narrow, composed of four to seven approximate, appressed, sessile branches, the lower ones about 1 inch long, the upper becoming very short, densely flowered; spikelets mostly in alternate pairs, of which one is sessile, the other short-pediceled, forming three to four rows, turgid, oblong, obtuse, and 1½ lines long; lower glume two-thirds as long as the spikelet, 5-nerved, second glume 7-nerved, third 5-nerved, a little longer than the fertile flower; sterile flower triandrous.—Mexico, Texas, New Mexico to Colorado.

10. **P. reticulatum** Torr. Culms 10 to 15 inches high, much branched below, leafy; leaves 1½ to 3 inches long, acute, scabrous or pubescent, as also are the sheaths; panicle 2 to 3 inches long, lateral ones shorter, close or dense; branches single or fasciculate, unequal, 1½ or 2 inches long, the longer with interrupted spikelets, which are about 1½ lines long, single or in pairs, one sessile and one pediceled, obovate, acutish; first glume one-fourth to one-third as long as the spikelet, acutish, second and third strongly 5- to 7-nerved, and conspicuously reticulately veined.—Texas to Arizona.

11. **P. Texanum** Buckley. Culms stout, 2 to 4 feet high, branching from a decumbent and sometimes rooting base, leafy, smooth; leaves lanceolate, 4 to 10 inches long, 6 to 12 lines wide, smoothish or scabrous above and on the margins; sheaths softly and sparsely pubescent, nodes pubescent; panicle (the base generally inclosed in the upper sheath) 4 to 8 inches long, ½ to 1 inch wide, of 5 to 10 erect, rather slender, simple, erect branches 1 to 3 inches long, closely flowered; rachis scabrous-pubescent; spikelets single or in pairs, alternate along the angular rachis, oblong, lanceolate, acute, 2 to 2½ lines long, smooth, or finely pubescent; first glume broadly ovate, half to two-thirds as long as the spikelets, acute, 5-nerved; second and third glumes equaling the spikelet, strongly 5- to 7-nerved, perfect flower ovate or oblong-ovate, acutish, transversely wrinkled with fine reticulated striæ. Cultivated for a forage grass.—Texas.

12. **P. Chapmani** Vasey. Bull. Torr. Club, XI. p. 61. (*P. tenuiculmum* Chapm. non Meyer.) Culms filiform, 1½ to 2½ feet high, erect, simple; leaves chiefly radical, linear, half as long as the culm, about 2 lines wide, upper ones shorter; panicle 6 to 12 inches long, of eight to twelve remote, slender, erect spikes, the upper ones short and few- (3- to 6-) flowered, sessile, one-half inch long, the lower longer, sometimes subdivided, and with long, sheathed peduncles; rachis flexuous, bristle-like at the apex; spikelets about one line long, ovate; lower glume one-half as long as the spikelet, obtuse; upper glume 9-nerved.—Florida (*Chapman, Curtiss, Garber*).

13. **P. Reverchoni** Vasey. (Dept. Agr. Bot. Div. Bull. No. 8, p. 25.) Culms filiform from a thick, strong rootstock, erect, 10 to 18 inches high, simple; leaves chiefly radical, long and narrow, half as long as the culm; panicle 3 to 6 inches long, slender, an interrupted spike, at least above, below with short, 3- to 5-flowered, remote, fasciculate branches; spikelets 1½ lines long, plano-convex, obtusish; lower; glume one-half as long as the spikelet, 3-nerved, second and third 7-nerved; rachis terminated by a short bristle, sometimes also a bristle below the spikelets.—Texas (*Reverchon*). Distributed by Reverchon as *Setaria uniseta.*

14. **P. subspicatum** Vasey. (Dept. Agr. Bot. Div. Bull. No. 8, p. 25.) Culms 10 to 18 inches high, leafy; upper leaves longer than the lower (lowest 1 inch, highest 5 inches), 1 to 3 lines wide, rather rigid, light green, acute; panicle spicate at apex,

3 to 5 inches long, below with 5 or 6 short, approximate, appressed, rather lax branches, ½ inch to 1 inch long; spikelets 1 line long, a little curved; lower glume one-half as long as the spikelet; second glume 7-nerved; third glume 5-nerved; rachis with a short bristle at apex and sometimes a bristle below the spikelets.—Texas (*Buckley, Nealley*). These three (12, 13, and 14) form a natural group. Leaves shorter and more rigid, spike shorter and closer, and spikelets smaller than in the preceding.

15. **P. stenodes** Griseb. Fl. W. Ind., p. 547. (*P. anceps* var. *strictum* Chapm.) Culms 2 to 3 feet high, wiry, smooth; leaves erect, rigid, narrow (1 to 2 lines), 3 to 4 inches long; panicle narrow, 2 to 3 inches long, of five to six slender, short, appressed branches, sessile or nearly so, mostly single, sometimes two or three together; spikelets about 1 line long, lanceolate, acute; first glume half as long as the spikelet; second and third 5-nerved, acute.—In ponds and water, Florida to Alabama (*Dr. Mohr*) and Texas (*Nealley*).

§ 4. Platyphylla Vasey.

16. **P. platyphyllum** Munro. Culms decumbent and rooting at the lower joints, 1 to 2 feet high, branching below, pale green in color; leaves lanceolate, 3 to 4 inches long, 4 to 6 lines wide, smooth, firm, the base clasping; margins scabrous, pale green; sheaths smooth, striate, the upper one inclosing the base of the panicle consisting of 3 to 5 simple, sessile, alternate, slightly spreading, distant branches, each 1½ to 3 inches long; spikelets sessile, and alternate on a flattened rachis; lower glume thin, obtuse, one-third as long as the second and third, the latter 5-nerved, smooth, and one-third longer than the obtuse fertile flower; sterile flower a glume only.—Texas (*E. Hall, G. C. Nealley*).

17. **P. plantagineum** Link: Hort. I. 206. Much like the preceding, but stouter and larger, with longer and wider leaves (6 to 10 inches by 6 to 9 lines); the spikes more remote, longer (2 to 4 inches), and the lower peduncled in the sheaths; spikelets much like the preceding.—Introduced on ballast ground at Philadelphia.

§ 5. Brachiaria Benth.

18. **P. prostratum** Lam. (Chapm. Fl. S. States, suppl., p. 666. *P. cæspitosum* Swartz?.) Culms creeping and rooting at the base, then ascending, 1 to 2 feet long, with rather distant leaves (1½ to 2 inches long), lanceolate or ovate-lanceolate, acute, clasping at the ciliate base; sheaths shorter than the internodes; panicle exserted, short, about 2 inches long, of 5 to 8 simple or sub-simple branches, the lowest 1 to 1½ inches long, closely flowered; rachis frequently with stiff hairs; spikelets three-quarters of a line long, smooth; first glume one-quarter as long as the spikelet, second and third equal; perfect flower striate-punctulate, mucronate-pointed. Our specimens agree with *Trinius*, Fig. 185 A.—Louisiana (*Langlois*) and Texas (*Nealley*).

19. **P. cæspitosum** Swartz.? (Swartz. Fl. W. Indies.) Culms numerous, succulent, and thickish, rooting at the base, ascending to 1 or 2 feet long; leaves crowded below, erect, linear-lanceolate, 2 to 4 inches long, 3 to 4 lines wide, ciliate on the margins, striate; lower sheaths inflated; paniole about 2 inches long, of 5 to 8 branches becoming long exserted; rachis and branches hairy and angular, lower branches about 1 inch long; spikelets 1¼ to 1½ lines long, ovate-oblong, acute, lower glume one-third as long as the spikelet; perfect flower as in the preceding, but larger. The whole plant pale green.—Probably in Texas and New Mexico, certainly in Chihuahua, Mexico (*Pringle*, No. 375).

20. **P. fuscum** Swartz. (*P. fasciculatum* Swartz: Chapm. Fl. S. States, p. 574.) Culms 1 to 3 feet high, decumbent and branching at base; leaves linear or lanceolate-linear, 3 to 10 inches long, glabrous or pubescent; panicle 3 to 6 inches long, spreading, the branches simple or more or less fasciculated below, the lower about 2

inches long; rachis hairy; spikelets in pairs or in small clusters, 1½ lines long, acutish, lower glume about one-third as long as the spikelet, deltoid, second and third glumes 5- to 7-nerved, and cross-nerved.—Texas.

Var. MAJOR. Culms stouter, 2 to 3 feet high; branched; sheaths and leaves scabrous-punctulate or smoothish, leaves broader, acuminate; panicle fuller, 3 to 6 inches long, branches more numerous (up to 20 or 30), scattered and fasciculate; rachis and branches scabrous, and with scattered hairs.

Var. FASCICULATUM (*P. fasciculatum* Swartz). Leaves longer and wider (8 to 10 lines wide), panicle 4 to 5 inches long, the branches very numerous, spikelets becoming dark brown.—Southern Florida.

21. **P. grossarium** Linn. Amoen. v. p. 392.

Specimens from ballast ground at Philadelphia have been referred to this species, but if correct it seems too near *P. fuscum*.

§ 6. POLYSTACHYÆ Benth.

Small forms **P. anceps** might come in this group.

22. **P. barbinode** Trin. (PARA GRASS). (Icon. XXVII. t. 318), (*P. molle* Swartz). Culms 2 to 6 feet high, stout, ascending; nodes villous; leaves linear-acuminate, glabrescent; panicle lax, 6 to 8 inches long; branches mostly simple, fascicled, spreading, about 2 inches long, somewhat distant; spikelets 1 to 1½ lines long, glabrous, one-sided, spreading; lowest glume deltoid, one-fourth as long as the spikelet, 1-nerved, second and third equaling the spikelet, 5-nerved; fertile flower ellipsoidal, bluntish.—Introduced and cultivated in the South.

23. **P. gymnocarpon** Ell. (Chapm. Fl. S. States, p. 573.)—Perennial. Culms 2 to 4 feet high, erect, rigid, smooth; leaves lanceolate, smooth, 1 foot long or more, 1 inch or more wide, cordate at base; sheaths shorter than the internodes, striate, nodes black; panicle large, 9 to 15 inches long, branches 4 to 6 inches long, erect-spreading, scattered or 2 to 3 together, racemose; spikelets in nearly sessile clusters of 3 to 6, appressed along the branches, somewhat one sided, 2½ to 3 lines long, lanceolate; outer glumes nearly alike, lanceolate-subulate, rough-keeled, 2 to 3 times longer than the perfect flower; first glume 3-nerved, a little to one-third shorter than the second and third about 5-nerved; the third glume or neutral flower with a palet one-half as long.—Florida to Texas.

24. **P. repens** Lim. (Chapm. Fl. S. States, suppl., p. 666.) Culms 1½ to 2 feet high, from strong creeping rhizomes, leafy, covered below with loose sheath with short or deficient blades, the blades becoming longer upward, conduplicate or involute, the uppermost 3 to 4 inches long, sometimes pubescent at the base; panicle erect, thin, 3 to 4 inches long; the branches alternate, naked at base, erect or slightly spreading, the lower ones each with 2 or 3 rather long, appressed branchlets, short-pediceled and appressed, interrupted or racemose along the slender branches, 1 line long, oval, acute, smooth; the lower glume broad, obtuse, one-third as long as the spikelet, second and third about 7-nerved.—Sandy shores of the Gulf, Florida to Texas.

Var. CONFERTUM Vasey. Culms shorter, leaves very divergent and rigid, panicle more condensed, the branches shorter and spikelets more crowded, lower glume rather longer and less obtuse.—Mobile, Ala., to Vera Cruz, Mex. (2177 *F. Muller.*)

P. anceps Michx. See No. 55.

25. **P. laxum** Swartz. (Griseb. Fl. W. Indies, p. 548), of this group, common in the West Indies, is probably also in southern Florida, but I have seen no authentic specimens.

26. **P. hians** Ell. (Chapm. Fl. S. States, p. 573.) Perennial. Culms slender, smooth, 6 to 18 inches high, simple, from slender, wiry, creeping root-stocks; leaves linear, 3 to 5 inches long, 1 to 2 lines wide, smooth, erect; panicle rather small, 3 to 5 inches long, the slender, racemose branches 1 to 2 inches long, erect-spreading, mostly single and distant, the lower third naked; spikelets about 1 line long, in small, nearly sessile, approximate clusters; outer glumes ovate, acute, generally 3-

nerved, the lower one-half as long as the spikelet, third glume longer than the second and having a thick, rigid, obovate palet rather longer than its glume, and spreading apart from it, hence probably the name *hians*, from *hio*, to gape.—North Carolina to Texas.

27. **P. ciliatissimum** Buckl. Culms procumbent and much branched, often rooting at the joints, at first short-jointed and much condensed, with leaves 1 to 1½ inches long, and the panicles short and invaginate, becoming elongated, with long-exserted peduncle (lateral and terminal) becoming 1½ to 2 inches long, narrow, with a few short, few-flowered, appressed branches, and linear-lanceolate, acuminate leaves 2 to 4 inches long, ciliate on the margins below, with sparsely ciliate and hairy sheaths, the nodes white-woolly; spikelets ovate, acute, 2 lines long, pubescent or villous; the lower glume lanceolate, acute, 3-nerved, smooth, except at the base, two-thirds as long as the spikelet; second 11- to 13-nerved, pubescent to densely villous, with a smooth, acute, hardened point; the third, or flowering glume of the sterile flower a little shorter than the second, 5-nerved, ciliate on the margins, its palet equally long, ovate, thin; the fertile flower one-fourth to one-third shorter than the largest glume, obtusish, minutely furrowed.—Texas.

§ 7. Eupanicum Benth.

28. **P. Xanthophysum** Gray. (Gray's Manual, 6th ed., p. 631.) Culms erect, 1 to 2 feet high, simple or branched near the base; leaves lanceolate, acuminate, 4 to 6 inches long, 5 to 10 lines wide, smooth, except the scabrous margins, strongly 9- to 11-nerved, rather contracted at the ciliate, clasping base; panicle long-exserted, 2 to 4 inches long, of a few, simple, erect or appressed, few-flowered branches; spikelets obovate, 1½ lines long, minutely downy; lower glume about half the length of the spikelet, second and third about 9-nerved. Plant yellowish green.—Canada to Pennsylvania and Wisconsin.

29. **P. pedicellatum** Vasey. Culms 1 to 2 feet high, slender, branching below, smooth; culm leaves 2 to 3 inches long, 2 to 3 lines wide, gradually tapering to an acute point, erect, somewhat rigid; main panicle long-exserted, the lateral ones less so, all small and few-flowered, 1½ to 2 inches long, of 4 or 5 short branches, each only 2- to 3-flowered; spikelets long-pediceled, oblong-obovate, obtuse, 1½ lines long, slightly pubescent, the lowest glume at some distance from the others, ovate, 1-nerved, nearly half as long as the spikelet; second and third glumes oblong, obtuse, 7-nerved.—Texas (*J. Reverchon*).

Resembles *P. angustifolium*, Ell., but is smaller, with smaller, fewer-flowered panicle, and rather smaller spikelets.

30. **P. depauperatum**, Muhl. (Gray's Manual, 6th ed., p. 633.) Culms erect, simple, tufted, 6 to 16 inches high; leaves of the culm about three, erect, narrowly linear, 3 to 6 inches long; sheaths usually pubescent; panicle small, 1 to 2 inches long, contracted sometimes overtopped by the upper leaves; spikelets 1 to 1½ lines long, obovate; lower glume one-third the length of the 7- to 9-nerved upper ones.—New England, New York, Pennsylvania, Virginia, Florida, Texas, Arkansas and Missouri.

31. **P. angustifolium** Ell., *non* Chapman. Elliott's Bot. S. Car., I. p. 129. Culms weak, slender, smooth, 1 to 2 feet long, diffusely branched from the base; leaves linear, 3 to 5 inches long, 1 to 2 lines wide; sheaths short, nodes thickened; panicles simple, terminal and lateral, 3 to 5 inches long; the few branches single, capillary, distant, 1 to 3 inches long, bearing each 2 to 6 spikelets (mostly in pairs at the end of the branches); spikelets oblong-obovate, acute, 1½ lines long, the outer glumes papillose-hispid, the lower one minute, acutish.—South Carolina to Texas.

32. **P. nitidum** Lam. (Gray's Manual, 6th ed., p. 632.) Culms 10 to 20 inches high, slender but firm, rarely branched, smooth; leaves mostly at the base of culm, lanceolate or lance-linear, 1 to 2 inches long, rather rigid, and with the sheaths smooth, the culm leaves few and smaller; panicle ovate or oblong, 1½ to 2½ inches long; branches verticillate below, the lower ones 1 to 1½ inches long, spreading, ca-

pillary, numerously flowered; purplish spikelets on pedicels 2 to 4 times as long, oval, one-half to two-thirds line long, pubescent, the lowest glume one-fourth to one-third the length of the spikelet.

Var. MINOR (*P. ramulosum*, of Chapm. Suppl., but I think can not be the plant of Michx.). Lower than the type (6 to 8 inches high); tufted; leaves narrower and smaller; panicle 1 to 1½ inches long; rachis smooth; spikelets smooth or nearly so; second and third glumes 5-nerved.—Florida.

Var. ENSIFOLIUM (*P. ensifolium* Baldw.). Radical leaves linear-lanceolate, 1½ inches long, smooth, those of the slender (8 to 12 inches long) culm distant, small (about one-half inch), and horizontally divergent; panicle depauperate, less than an inch long, the rays single and few-flowered.—Florida. Described from Dr. Chapman's specimens.

Var. MAJOR. Here could be placed several variable forms, mostly smooth, but with stouter culms, a more open, less dense panicle, with fewer and stouter branches (sometimes reflexed), and fewer and larger spikelets.

33. **P laxiflorum** Lam. (Gray's Manual, 6th ed., p. 633.) Culms erect, weak, 6 to 18 inches high, rarely branched, smooth below the panicle; leaves linear or lanceolate-linear, 3 to 7 inches long, 3 to 4 lines wide, mostly radical, the 2 or 3 of the culm little shorter, acuminate, nearly smooth except on the ciliate margins, pale green or yellowish-green; sheaths mostly shorter than the leaves, sparsely and retrorsely villose; ligule a ring of soft, white hairs; panicle capillary, 2 or 3 inches long; branches sparingly divided from the base, mostly single, alternate and few-flowered, spreading; the rachis and branches sparsely long-hairy; spikelets long-pediceled, 1 line long, oval or elliptical, obtuse, strigosely pubescent, lower empty glume ovate, 1-nerved, one-quarter as long as the spikelet; second and third glumes 7- to 9-nerved; fertile flower as long as the spikelet, acutish.—In sandy woods.

Var. PUBESCENS. Culm rather stouter, and pubescent, 12 to 15 inches high; leaves hairy, shorter, lanceolate, the lower 2 to 2½ inches long, 3 to 5 lines wide, the upper about 1 inch, upper sheath elongated; panicle 2 to 3½ inches long, the branches and spikelets more numerous, and spikelets smaller; lowest glume roundish ovate, one-third as long as the spikelets; second and third glumes 5- to 7-nerved. Closely approaches *P. nitidum*, and is perhaps the *P. nitidum* var. *ciliatum* Torr.

34. **P. dichotomum**, Linn. (Gray's Manual, 6th ed., p. 633.) Culm 10 to 30 inches high; at first mostly simple, smooth, or pubescent, bearing a more or less exserted, spreading, compound panicle, 1 to 4 inches long, and lanceolate, flat leaves; those of the culm larger above, 3 to 4 inches long; those at the root tufted, usually ovate-lanceolate, short, and thick; the culms commonly branching later in the season, the branches often clustered, and bearing smaller, mostly included panicles; spikelets ⅓ of a line long oblong-obovate, pubescent or downy, lower glume one-third as long as the spikelet.

Var. BARBULATUM. With the nodes barbed, and with the sheaths smooth or pubescent.

Var. VIRIDE. Smooth all over, leaves light green and narrower.

Var. DIVARICATUM. Erect, 6 to 9 inches high, slender, smooth, very much branched above the base, cæspitose, the radical leaves very short and tufted, those of the culm and branches very narrowly linear or involute, acuminate, about 1 inch long, divaricate, the numerous panicles small, racemose, few-flowered; the spikelets on alternate filiform pedicels ¼ to 1 inch long; spikelets three-fourths of a line long, oval-oblong, smooth; third glume equaling the spikelet 7-nerved; fertile flower as long as the spikelet.

Var. VILLOSUM (*P. villosum* Ell.). Culms decumbent, branching from the first; leaves scabrous above; ciliate, sheaths and culms villous, panicle thinner and fewer-flowered.

Var. ELATUM. Culms tall (2 to 3 feet), erect, smooth; cauline leaves 4 to 5 inches long, 5 to 6 lines wide, smooth, very acute; panicle 4 inches long, smooth; the branches long, erect, spreading, rather sparsely flowered; spikelets a little more

than 1 line long, smooth, oblong, acutish, the lower glume ovate, acute or acutish, nearly half as long as the spikelet, fertile flower shorter than the spikelet.

35. **P. neuranthum** Griseb. (Pl. Cubens. p. 232). Erect or ascending, about 1 foot high, slender, smooth; leaves linear-acuminate, 2 to 4 inches long, firm, flat or subinvolute; terminal panicle long exserted, 1 to 2 inches long, with few-flowered, divergent branches, the lateral panicles numerous, narrow, short (less than 1 inch long), oval, pubescent; lower glume minute, deltoid, nearly nerveless, one-third to one-fourth as long as the spikelet, second and third 7-nerved, equaling the fertile flower, which is ovoid, obtuse, and smooth.

Var. RAMOSUM Griseb. Ascending, much branched, leaves flat or involute, very narrow; spikelets 1 line long, elliptical, obtuse.—South Carolina, Florida, to Texas.

36. **P. Joorii** Vasey. Culms about 1 foot high, much branched above, very leafy; leaves 4 to 6 inches long, 6 to 10 lines wide, thinnish, smooth, those of the extreme branches smaller; panicles numerous, small, inclosed in the sheaths, few-flowered; spikelets oblong, over 1 line long, sparsely pubescent.—Louisiana (*Dr. J. F. Joor*) and Mississippi (*S. M. Tracy*).

This is very unusual in its abundant large leaves and condensed form, growing in dense tufts.

37. **P. nudicaule** Vasey. Culms 1½ to 2 feet high, slender, with 2 or 3 long internodes; leaves mostly near the base, linear-lanceolate, 2 to 4 inches long, 2 to 3 lines wide, smooth, light green, the 2 to 3 culm-leaves distant, narrow, giving the culm a naked appearance; panicle long exserted, small, smooth, 2 to 3 inches long, 1 inch wide, sparsely flowered, branches alternate; spikelets elliptical-oblong, acute, 1½ lines long, smooth, the slower glume very small (one-fifth as long as the spikelet); second glume 7-nerved; third, 5-nerved; fertile flower one-fourth shorter than the spikelet.—Swamps, Santa Rosa County, Florida (*A. H. Curtiss*).

38. **P. consanguineum Kth.** (Gray's Manual, 6th ed., p. 633) (*P. villosum* Ell.). Culms about 1½ feet high, erect, branching in age; leaves linear-lanceolate, mostly about 3 inches long, 2 to 5 lines wide, the later ones almost filiform, somewhat pubescent, sheaths villose; panicle 2 to 3 inches long, open, rather thin; spikelets 1 to 1½ lines long, pubescent.—South Carolina to Florida.

39. **P. scoparium** Lam. (Gray's Manual, 6th ed., p. 632). (*P. pauciflorum* Ell.) Culms erect, becoming branched and reclining, 1 to 2 feet high, somewhat scabrous; leaves erect, about 3 inches long, 4 to 5 lines wide, faintly nerved, scabrous on the margins, hairy fringed near the base, the sheaths bristly with stiff spreading hairs or smoothish; the panicle 2 to 3 inches long, spreading, open, branches smooth, mostly simple, alternate, rather few-flowered; spikelets 1½ to 1⅝ lines long, oval to obovate, hairy or smoothish; lower glume about one-third as long as spikelet.—New England to California and southward. A widespread species.

Var. MAJOR (*P. scoparium* Ell.). This differs from the preceding in its stouter, rougher culm, larger leaves, 4 to 6 inches long, three-fourths of an inch wide (1 to 1½ inches wide, Elliott), soft-pubescent below, and its spikelets 2 lines long.—We have only seen this from South Carolina (*Dr. Ravenel*).

Var. ANGUSTIFOLIUM. Culms tall and erect, 2 to 3 feet high, branching; leaves longer and narrower than the type, 3 or 4 inches long, 3 to 4 lines wide, rather rigid; sheaths sparsely pubescent; panicle long-exserted, 3 to 4 inches long.—South Carolina (*Dr. Ravenel*), Illinois (*Dr. Schenck*) and Fortress Monroe, Va. (*Dr. Vasey*).

Var. LIEBERGII (*P. Liebergii* Scribn.) Culms tall and erect, unbranched, 2 feet high; leaves lanceolate, distant, 3 to 4 inches long, 6 to 9 lines wide, scabrous or papillose, hairy, about 11-nerved; sheath shorter than the internodes; panicle about 3 inches long, 1 inch wide, the fewish branches erect-spreading and few-flowered.—Plymouth County, Iowa (*John Lieberg*).

40. **P. Wilcoxianum.** Culms about 6 inches high, entire or sparingly branched and with the leaves more or less white-hairy; leaves linear-lanceolate, erect, acuminate, 2 to 3 inches long, hairy both sides, rather rigid, sheaths striate, hairy,

mostly longer than the internodes, ligule obsolete; panicle oblong, rachis zigzag, 1 inch long; lower branches subverticillate, short; spikelets about 1¼ lines long, pubescent; lower glume ovate, one-fourth as long as the spikelet; second and third glumes with 5 to 7 broad nerves, the third hardly as long as the flowering glume.—Nebraska (*Dr. T. E. Wilcox*). Perhaps a depauperate form of the preceding.

41. **P. sphærocarpon** Ell. (Chapm. Fl., S. States, Suppl. p. 667.) Culms 15 to 24 inches long, 5 to 7 lines wide, lanceolate, acute, obscurely nerved, smooth except at the ciliate-cordate base; sheaths shorter than the joints, smooth; panicle 3 to 4 inches long, spreading; spikelets oval, five-eighths to three-fourths of a line long, smoothish lower glume one-third as long as the spikelet.—Dry or moist ground, of same range as the next species. Differs from *P. dichotomum* in its wider, more rigid, smooth, pale leaves, with cordate base.

Var. FLORIDANUM. Culms 1½ to 2½ feet high, rigidly erect; leaves rigid, erect, 6 to 7 on the culm, lanceolate, smooth, about 3 inches long, 5 to 6 lines wide, the margins near the base, and sheaths ciliate; panicle oval to oblong, 3 to 5 inches long, and spikelets one-half line long, pubescent, the ower glume ½ or ⅓ as long as the spikelet.—Florida.

Described by Dr. Chapman as *P. sphærocarpon* Ell., but it hardly agrees with Elliott's description. It is intermediate between *P. microcarpon and P. sphærocarpon.*

42. **P. microcarpon** Muhl. (Gray's Manual, 6th ed., p. 633.) (*P. multiflorum* Ell.) Culms 2 to 3 feet high, stout, erect, smooth; leaves 4 to 7 inches long, 9 to 12 lines wide, lanceolate, gradually tapering to a slender point, with nine to eleven nerves, roughish above and on the margin, sometimes bristly-ciliate at the rounded, clasping base, smooth on the under side, sheaths mostly longer than the internodes, smooth except on the margins; ligule nearly obsolete, panicle becoming long-peduncled, 3 to 7 inches long, 1 to 2 inches broad, spreading, multiflorous, branches mostly verticillate, very numerous, flowering to the base, spikelets mostly long-pediceled, oval, five-eighths of a line long, nearly smooth, lower glume one-fourth as long as spikelet, second glume 7-nerved.—Low ground, Massachusetts to Texas.

43. **P. viscidum** Ell. (Gray's Manual, 6th ed., p. 632.) Culms 2 to 4 feet high, stout, becoming much branched, leafy, velvety-downy all over, except a narrow ring below each node; sheaths soft-downy, the hairs spreading or reflexed and often viscid, leaves downy or smoothish, lanceolate, 4 to 8 inches long, diffuse, the branches numerous and much subdivided, spikelets fully 1 line long, oblong-obovate, pubescent, lower glume one-fourth to one-fifth as long as the 7- to 9-nerved upper one.—Common.

44. **P. commutatum** Schultes. (Chapm. Fl., S. States, Suppl. p. 667.) (*P. nervosum* Muhl.) Culms 2 to 2½ feet long, erect, unbranched, rather slender, smooth; leaves at the base rigid, ovate-lanceolate, the three or four culm leaves firm but not rigid, mostly 3 to 4 inches long, 8 to 12 lines wide, acuminate, cordate at base, smooth except on the margins, sheaths smooth or somewhat pubescent, much shorter than the nodes; panicle peduncled, 3 to 5 inches long, 2 to 3 inches wide, open, rather thin, branches smooth, single or subverticillate; spikelets rather long-pediceled, oblong, sparsely hairy, 1 to 1¼ lines long; lower glumes one-third as long as the spikelet, second about 5- and third 7-nerved.—Pennsylvania to Texas. A fine species, in appearance like *P. clandestinum*, but more slender, with shorter leaves and smaller spikelets, which are early deciduous.

Var. MINOR, differs from the preceding in its rather smaller size (1½ to 2 feet), and smaller panicle, and the spikelets more persistent.—Southern States.

45. **P. clandestinum** Linn. (Gray's Manual, 6th ed., p. 632.) Culms rigid, 2 to 3 feet high, leafy to the top, rarely branched, upper nodes smooth, the lower often hairy; sheaths smoothish, or the lower ones often rough with papillose, bristly hairs, shorter than the internodes, leaves large, lanceolate to oblong-lanceolate, 4 to 8 inches long, 9 to 15 lines wide, with a cordate, clasping base, very taper-pointed, smooth except the rough margins; panicle at first partially sheathed, becoming long-pedunculate, some-

what oblong in outline, 4 to 6 inches long, open and becoming spreading, branches verticillate; spikelets 1½ lines long, slightly pubescent or smooth, oblong-ovate to obovate; the lower glume acutish, nearly one-half as long as the spikelet, second and third equal, many nerved; perfect flower oblong, pointed.—New England to Virginia, North Carolina, and westward to Illinois.

46. **P. latifolium** Linn. (Gray's Manual, 6th ed., p. 632.) Culms 1 to 2½ feet high, smooth, mostly simple, the nodes (generally) and the collar of the sheath soft wooly-hairy; sheaths smooth or more or less pubescent; leaves broadly lanceolate from a cordate, clasping base, 3 to 4 inches long, ¾ to 1½ inches wide, tapering to a point, roughish above, smooth, or sparsely hairy below, 11- to 13-nerved; panicle more or less exserted, becoming long-peduncled, 2 to 4 inches long, the branches mostly alternate, spreading, rather few flowered; spikelets 1½ to 2 lines long, obovate, sparsely pubescent; the lower glume one-third, or less than one-half as long as the spikelet, upper one about 9-nerved.—Maine to Texas.

Var. MOLLE. Downy all over.—Virginia to Louisiana.

Var. AUSTRALIS. Leaves more contracted at base, and spikelets larger (2 to 2½ lines).—Alabama to Texas.

47. **P. scabriusculum** Ell.? Chapm. (Chapm. Fl. S. States, p. 576). (*P. Nealleyi* Vasey.) Culms 3 to 4 feet high, firm, smooth, rarely branched; leaves linear-lanceolate, 4 to 8 inches long, one-half inch wide, long-pointed, firm, mostly smooth except near the base; sheaths shorter than the joints, mostly smooth, or sometimes sparsely pubescent; panicle larger, 5 to 8 inches long, diffuse, smooth, branches mostly alternate, much divided, the larger ones 3 inches long; spikelets ovate, acutish, sparingly pubescent when young, becoming smooth; lower glume small; second glume strongly 7- to 9-nerved.—North Carolina to Texas.

This is the *P. scabriusculum* described by Chapman, but does not appear to me to answer that of Elliott, who compares his with *P. virgatum*.

48. **P. capillare** Linn. (Gray's Manual, 6th ed., p. 630). Culms 10 to 20 inches high, mostly branched at the base. rather robust, erect or ascending; sheaths and usually the leaves copiously hairy or hirsute; panicles, lateral and terminal, half to two-thirds the length of the plant, vaginate below, much branched, the branches divaricate when old; spikelets ovoid to oblong or lanceolate, obtusish, acute or even acuminate, ¾ to nearly 2 lines long, smooth, on long capillary pedicels; lower glume one-half to two-thirds as long as the spikelet, obtuse to acuminate, fertile flower obtusish, rather shorter than the spikelet.—All over the continent.

Var. CAMPESTRE Gattinger. Culms slender, 1½ to 2 feet high, much branched, leaves and sheaths sparsely hirsute, panicle, rather pyramidal, much shorter than in the type, 4 to 6 inches long, more open and thinly flowered, spikelets three-fourths of a line long, smooth, oblong, rather acute, lower glume obtusish.—Tennessee (*Dr. Gattinger*).

Var. FLEXILE Gattinger. Culms slender, 1½ to 2½ feet high, branched below, leaves linear, 6 to 10 inches long, narrow, erect, smooth or smoothish, sparsely ciliate on the margins and sheaths, panicle longer and narrower than in the preceding, 5 to 9 inches long, 2 to 4 inches wide, branches slightly spreading, single or in twos, smooth; spikelets 1¼ lines long, lanceolate-acuminate, lower glume acute, perfect flower one-third shorter than the spikelet.—Tennessee (*Dr. Gattinger*).

49. **P. capillarioides** Vasey. Contr. U. S. Herb. 1, p. 54. In habit and appearance much like *P. capillare*, but generally less hirsute, and with a smaller panicle. The branches of the panicle are more rigid. The spikelets are twice as large and more clustered at the end of the branches. They are 2 lines or more long; long-conical and acuminate.—Texas (*Mr. G. C. Nealley, Miss Mary B. Croft*).

50. **P. autumnale** Bosc. (Gray's Manual, 6th ed., p. 630.) (*P. divergens* Muhl.) Culms 12 to 18 inches high, erect or decumbent below; leaves comparatively small, 2 or 3 inches long, 2 to 3 lines wide, smooth except on the scabrous or undulate margins; sheaths smooth or the lower ones, sparsely hairy, ligule membranaceous, obtuse,

conspicuous; panicle very effuse, one-third the length of the culm or more, the capillary branches long and sparingly divided, often reflexed at maturity, and somewhat scabrous, the axils sometimes sparsely hairy, the branchlets or pedicles long, naked, and terminated by a single spikelet, spindle shaped or obovate, 1 to 1½ lines long, acute; the lower glume very minute (one-sixth to one eighth as long as the spikelet); second and third glumes acute, ciliate near the apex, or in southwestern specimens (var. *pubiflorum*) pubescent all over, but little longer than the acute flowering glume.—Illinois to Texas and the Southern States.

51. **P. Hallii** Vasey. Bull. Torr. Club, xi. p. 61. Culms slender, 1 to 2 feet high, branching; leaves slender, 4 to 6 inches long; sheaths sparsely pubescent or smooth; panicle open, diffuse, 4 to 5 inches long, sparsely flowered; spikelets 1½ lines long, acute, smooth; lower glumes half as long as spikelets, perfect flower a little shorter.—Texas. More slender than *P. capillare*, with smoother culms, smaller panicles, stouter branches, and rather larger spikelets.

This species has resemblance to *P. capillare* on one side and to *P proliferum* on the other. From the first, it is distinguished by its more erect slender culms, never more than sparsely pubescent, smaller panicle, with erect-spreading stouter branches, and usually larger or thicker spikelets; from the second, by its smaller size, more erect culms, and smaller panicles, with shorter branches.

52. **P. proliferum** Lam. (Gray's Manual, 6th ed., p. 630.) Annual; culms usually thickish, often succulent, branching, geniculate at the decumbent or procumbent base, 1½ to 3 feet long, glabrous; leaves linear, 6 to 12 inches long, sheaths flattened, glabrous, ligule ciliate; panicles terminal and lateral, 4 to 12 inches long, the long, slender primary branches at length spreading and diffuse; spikelets 1 to 1½ lines long, pale green, sometimes purplish, appressed, short pediceled, lower glume broad, obtusish, about one-fourth as long as the spikelet; perfect flower a little shorter than the spikelet.—Damp places, Maine to Texas.

Var. GENICULATUM (*P. geniculatum* Ell.) Culms 3 to 6 feet high, succulent, sometimes nearly an inch thick at the base, bent and branching at the joints, leaves sometimes 2 feet long and 6 to 10 lines wide; sheaths much inflated when young, sometimes a little hairy at the base; panicle sometimes 2 feet long, very diffuse. A valuable grass.—Southern States to Texas.

53. **P. miliaceum** Linn. Sp. Plant, 86. Culms 2 to 4 feet high, erect, branched, pubescent; sheaths loose, striate, hirsutely pubescent; leaves flat, linear-lanceolate, 6 to 10 inches long, 4 to 8 lines wide, smoothish above, sparsely pubescent below; panicle oblong, nodding, 6 to 10 inches long, branches verticilate, erect-spreading (not diffuse), solitary or in pairs, angular. hispid, or scabrous; spikelets ovate, acuminate, glabrous, 2 lines long; lower glume broad, very acuminate, 5-nerved, about one-half as long as the spikelet; the third glume 7- to 9-nerved, a little longer than the oval, acute, biconvex, perfect flower.—Cultivated and rarely escaped from cultivation. Valuable for forage.

54. **P. verrucosum** Muhl. (Gray's Manual, 6th ed., p. 631.) Culms slender, 1 to 3 feet long, somewhat branching, smooth; leaves linear-lanceolate, 3 to 4 inches long, 2 to 3 lines wide, and with the sheaths glabrous; panicles mostly terminal, 6 to 10 inches long, diffusely-spreading, branches mostly single, capillary, rather few flowered; spikelets ¾ to 1 line long, obovate or oval, obtuse or abruptly acute; the outer glumes roughened with fine warts, the lower one about one-fourth as long as the spikelet; perfect flower acute, about equaling the spikelet.—New England to Florida and Mississippi.

55. **P. sparsiflorum** Vasey. (*P. angustifolium* Chapm. non Ell.: Chapm. Fl. S. States, p. 574.) Culms weak, slender, smooth, 1 to 2 feet long, diffusely branched from the base; leaves linear, 3 to 5 inches long, 1 to 2 lines wide; sheaths short; nodes thickened; panicles simple, terminal and lateral, 3 to 5 inches long, the few branches single, capillary, distant, 1 to 3 inches long, bearing each 2 to 6 spikelets, mostly in pairs at the end of the branchlets; spikelets oblong-obovate, acute, 1½ lines

long, the outer glumes papillose-hispid, the lower one minute, acutish.—South Carolina to Texas.

56. **P. anceps** Michx. (Gray's Manual, 6th ed., p. 631.) Culms flattened, erect, 2 to 3 feet high, less stout than in *P. agrostoides*, from strong creeping root-stocks; leaves rather broadly linear, a foot or more long, 4 to 5 lines wide, smooth or the lower ones with the sheaths pubescent; panicles contracted, lateral and terminal, 6 to 12 inches long, the branches from single to verticillate, rather distant, particularly below, generally very abundantly flowered; spikelets 1 to 1½ lines long, ovate-lanceolate, pointed, the apex a little curved; lower glume about one-half as long as the spikelet; upper glume 5- to 7-nerved.

Var. PUBESCENS. Leaves and sheaths more or less pubescent; panicle and branches slender; spikelets ovate lanceolate, acute, little more than 1 line long.—Mobile, Ala. (*Dr. Mohr*).

Var. ANGUSTA. Lower sheaths villose; leaves very long and narrow, erect, rigid; spikelets narrowly lanceolate, acuminate, 1½ lines long, the lower glume one-third as long as the spikelet.—Texas. (*G. C. Nealley.*)

Var. DENSIFLORUM. Leaves broad; panicle glomerate and interrupted, the branches densely flowered; spikelets lanceolate, 1½ lines long.—Texas (*J. F. Riggs*).

57. **P. agrostoides** Spreng. (Gray's Manual, 6th ed., p. 631.) Culms flattened, erect, stout, 2 to 4 feet high, usually in thick clumps, glabrous, much branched above, the branches erect; leaves linear, 1 to 2 feet long, 3 to 4 lines wide, smooth as also the compressed sheaths; panicles terminal and lateral, 4 to 12 inches long, oblong, becoming pyramidal, very full, the lower branches 2 to 3 inches long, much subdivided to the base; spikelets racemose, very short pediceled, crowded and mostly one-sided on the branches, ovate-oblong to lanceolate, ¾ to 1½ lines long; lower glumes acute or acutish, half as long as the spikelet; second and third glumes 5-nerved, half longer than the perfect flower, the latter slightly bearded at the apex.—In wet ground.

Varies in the size and form of the spikelets, which in the Western form seldom exceed a line long; there is an Eastern form in which the spikelets are lanceolate, about 1½ lines long, and the perfect flower small and conspicuously stalked.

58. **P. bulbosum** H. B. K. Nov. Gen. I. p. 99. Rhizoma creeping, thick, bulbous; culms 4 to 5 feet high, smooth, stout, with long internodes; leaves long and narrow (1 to 2 feet by 2 to 4 lines), smooth, or the lower ciliate below; panicle about 1 foot long, spreading, copious, pale green; branches scattered and verticillate, the lower 4 to 5 inches long, much subdivided nearly to the base, branchlets slender and numerously flowered; spikelets sometimes in pairs or racemose, 1½ lines long, smooth, obtuse or acutish, not acuminate; lower glume half or rather more than half as long as the spikelet, broad, three-nerved, acutish; second and third glumes equal, 5-nerved, the third with a narrow palet; perfect flower as long as the spikelet, oblong, lanceolate, abruptly acute, the point sometimes a little roughened.—Texas, New Mexico and Arizona.

Var. MINOR (*P. maximum*, var. *bulbosum* Munro). A smaller form, about 2 feet high, with the panicle much reduced.—In same region.

Probably *P. avenaceum Kth.* is not different.

59. **P. maximum** Jacq. Coll. I. p. 76. (P. *jumentorum* Pers.) Culms erect, 3 to 5 feet high, glabrous; nodes softly pubescent; leaves linear, 1 to 1½ feet long, 9 to 12 lines wide, rather rigid, margin scabrous; sheaths smooth; panicle 1½ feet long, much branched, hispid or scabrous, the branches verticillate, long and contracted, racemose, scabrous; spikelets mostly short-pediceled, 1½ lines long, ovate, smooth, acute; lower glumes about one-third as long as the spikelets; second glume shorter than the spikelet; perfect flower acute.—Introduced and cultivated in the South.

60. **P. amarum** Ell. (Gray's Manual, 6th ed., p. 631.) Culms 2 to 3 feet high, from a stout running root stock, thick, columnar, nearly one-half inch in diameter; leaves nearly flat, almost coriaceous, glaucous, 1 to 1½ feet long, 4 to 6 lines wide, tapering

to a long, slender point; sheaths glabrous, striate; panicle 1 foot or more in length, appressed, or becoming somewhat spreading, the lower branches verticillate, 6 inches long, subdivided nearly to the base, narrowly paniculate; spikelets rather racemose, ovate, 2½ lines long, acute; glumes thick, the lower glume about two-thirds the length of spikelet, acute; second glume the longest, 7-nerved, acuminate; third glume rather shorter and obtusish; perfect flower linear-oblong, obtuse, one-fourth shorter than the spikelet.—Grows among the sand hills on the seashore. South Carolina to Florida.

Var. MINOR Vasey & Scribn. Leaves involute; panicle shorter, narrower, distantly branched, comparatively few-flowered, the branches rather glomerate and unequal; spikelets rather large (2½ to 3 lines); the lower glumes longer, or nearly as long as the spikelet.—Fort Monroe, Va., and northward, near the coast.

61. **P. virgatum** Linn. (Gray's Manual, 6th ed., p. 631.) Stout, erect, unbranched, 3 to 5 feet high, from strong, creeping root-stocks; leaves flat, very long (1 foot or more), 3 to 4 lines wide, smooth; panicle compound, 6 to 18 inches long; branches single to verticillate, generally very numerous and becoming diffuse, spreading or drooping; spikelets on rough pedicels, 1½ to 2 lines long, ovate to ovate-lanceolate, pointed, smooth; lower glume more than half the length of the spikelet (sometimes two-thirds), 5-nerved; second 5-nerved; third 5- to 7-nerved, acute to acuminate, larger than the perfect flower; sterile flower with 3 stamens; widely diffused and quite variable.—Maine to Florida, and throughout the interior of the country. The Atlantic form has spikelets about 1½ lines long. The Western form has spikelets about 2 lines long, the glumes acuminate. A form on the Atlantic coast has the panicle quite close and rather oblong, and may be called var. CONFERTA; another form (var. ELONGATA) has a very long and narrow panicle, with spikelets even 2½ lines long.

62. **P. Havardii** Vasey. Bull. Torr. Club, XIV. p. 95. (*P. virgatum* var. *macrospermum*, Vasey.) With the habit of Western forms of *P. virgatum*, but much stouter; culms 5 to 6 feet high, with rigid, involute, long-pointed, glaucous leaves, ligule a ring of short hairs; panicle 1½ feet long, diffuse, the branches less abundantly flowered; spikelets 3 lines long; lowest glume one-half as long as the spikelet, prominently 5- to 7-nerved; second glume 9-nerved, ovate, acuminate; third glume 5- to 7-nerved, its thick palet nearly as long; fertile flower about one-fourth shorter than the spikelet.—Guadalupe Mountains, Texas (*Dr. Havard, G. C. Nealley*).

§ 8. FRUTESCENTES Vasey.

63. **P. divaricatum** Linn. (Chapm. Fl. S. States, p. 575.) Shrubby, smooth; culms 6 to 8 feet high with short and spreading branches; leaves lanceolate, acuminate, 2 to 4 inches long, 2 to 6 lines wide, deciduous from the persistent sheaths; panicles terminating the branches, 1 to 3 inches long, nearly simple or branched, the branches rather distant and diverging, half to 1 inch long, rather sparsely subdivided; spikelets smooth, 2 lines long, tumid, obovate, nodding, on pedicels as long or longer; lower glume triangular-ovate, one-third as long as the spikelet; second and third glumes as long as the spikelet, very broad, 9- to 11-nerved; apex of the fertile flower downy-tipped.—Southern Florida.

§ 9. VILLIFLORA Vasey.

64. **P. Urvilleanum** Kth. (Bot. Cal. II. p. 259.) Culms 1½ to 2 feet high, from a strong running root-stock, the whole plant densely soft-hairy; near the base short-jointed and covered with weather-worn leaves or sheaths; leaves rigid, 12 to 18 inches long, 3 lines wide at the base, becoming convolute, and ending in a long, setaceous point, the upper ones exceeding the panicle, the latter 6 to 10 inches long, open, but rather contracted, the branches semiverticillate or scattered, the shorter ones flowering to the base; the longer ones (3 to 4 inches long) racemosely subdivided

and flower bearing toward the ends or throughout; spikelets 2½ to 3 lines long, ovate, acute; the empty glumes silky-villous; lower glume 7-nerved, two-thirds as long as the 15-nerved second glume; third glume rather shorter, 11- to 13-nerved; perfect flower oblong, glabrous, except on the margins, these long-ciliate.—In sand, southern California to Arizona.

§ 10. ECHINOCHLOA Benth.

65. **P. colonum** Linn. (*P. Walteri* Ell: Chapm. Fl. S. S. p. 577.) Culms 1 to 2 feet high, erect or decumbent at the base; leaves flat, glabrous; panicle 2 to 4 inches long, of several simple one-sided, distant, usually erect branches or sessile spikes, one-half to three-fourths inch long. Spikelets about 1 line long, ovoid, densely crowded in about 4 rows; outer glumes coarsely pubescent, or rarely glabrous, the first rarely half as long as the second and third, these nearly equal, often ending in short points, but not awned.—Introduced in the South, very common from Texas to California.

66. **P. Crus-galli** Linn. (Gray's Manual, 6th ed., p. 633.) Usually annual, culms coarse, decumbent, usually branching below, 2 to 4 feet high; leaves long, rough; sheaths rough, hispid or smooth; panicle dense, of numerous simple sessile spikes 1 to 2 inches long; spikelets crowded and clustered, outer glumes strongly hispid, acute or sometimes with long hispid awns. Introduced and very common. In the South appearing to be native. Very variable in size and appearance.

Var. HIRSUTUM, Torr.—Sheaths hirsute-pubescent or smooth; glumes long-awned.

Var. MUTICUM, glumes without awns.

§ 11. HYMENACHNE Benth.

67. **P. gibbum** Ell. (Chapm. Fl. S. States, p. 573.) Culms branched, decumbent; 2 to 3 feet high; leaves linear-lanceolate, acuminate to a long point, 6 to 12 inches long, one-half to three-fourths inch wide; panicle 5 to 6 inches long, confined; the branches appressed, 1 to 2 inches long; spikelets loosely crowded on pedicels about their own length, about 1½ lines long, oblong, obtuse; the lower glume 5-nerved one-fourth as long as the second, the latter strongly 11-nerved, gibbous at the base; sterile flower with 3 stamens; fertile flower smooth, half as long as the spikelet.—Swamps South Carolina to Florida and Mississippi.

OPLISMENUS Beauv.

Spikelets in small, sessile, distant clusters of the simple panicle, the spikelets one-sided in the clusters, the lower and the second empty glumes always (and the third frequently) awned, the lower long-awned.

1. **O. setarius** R. & S. (*Panicum hirtellum* Linn: Chapm. Fl. S. States, 577.) Culms weak, decumbent and rooting below, 1 to 2 feet long; leaves ovate-lanceolate, 1 to 1½ inches long; panicle racemose, 3 to 4 inches long, consisting of 5 to 9 small sessile clusters of spikelets, each of 3 to 5; lower empty glume with an awn 3 to 4 times as long as the spikelet, second a little shorter, the third less than a line long.—Florida to Texas, coastwise.

SETARIA Beauv.

Spikelets in a cylindrical spike-like or sometimes interrupted panicle. Below the articulation of the spikelets are several, usually many, bristles, which are supposed to be abortive branchlets and persistent after the fall of the spikelets. The spikelets contain one terminal fertile flower (its glume and palet indurated and striate), and usually a lower

male or sterile one. Empty glumes 3, the lower one small, the second usually shorter than the third, the flowering glume indurated; the second flower when present consisting of a thin palet and sometimes 4 stamens.

•*Bristles barbed upward.*

1. **Setaria viridis** Beauv. (GREEN FOXTAIL, PIGEON GRASS.) (Gray's Manual, 6th ed., p. 634.) Spikes 2 to 4 inches long, strictly erect, cylindrical, dense, tawny yellow (except in varieties); flowering glume transversely wrinkled, bristles 6 to 10 in cluster, much longer than the spikelets.—Very common in cultivated fields, etc.

2. **S. glauca** Beauv. (FOXTAIL, PIGEON GRASS.) (Gray's Manual, 6th ed., p. 634.) Spikes 2 to 4 inches long, strictly erect, cylindrical, dense, tawny yellow (except in varieties); flowering glume transversely wrinkled; bristles 6 to 10 in a cluster much longer than the spikelets.—Extensively naturalized.

There is a smooth, perennial form in the Southern and Southwestern States, called by Dr. Chapman var. LÆVIGATA. There is also a form in the South with purplish bristles.

3. **S. imberbis** R. & S. Syst. II. 891. Spikes very narrow (2 to 3 lines wide), 2 to 3 inches long, not so dense as in *S. glauca*, and the bristles (yellow to purple) much shorter, as long or twice as long as the spikelets; leaves narrow, erect.—Texas and southwestward.

4. **S. corrugata** Schultes. (Chapm. Flora S. States, p. 578.) (*Panicum corrugatum* Ell.) Culms 2 to 4 feet high, often branched below; leaves narrow, 6 to 12 inches long; spike cylindrical or tapering to the apex, dense, erect, or bending, 3 to 6 inches long; branches of panicle 6- to 10-flowered; fertile flower, strongly convex, transversely rugose, smaller than in *S. glauca*; bristles much exceeding the spikelets; purplish.—Dr. Chapman says, "Dry soil, Florida and Georgia."

5. **S. Italica** Kth. (Gray's Manual, 6th ed., p. 634.) Culms 1½ to 3 feet high; leaves wide; spikes oblong to cylindrical, dense, more or less compound, thick, nodding; bristles yellowish or purplish, longer or shorter than the spikelets.

Exceedingly variable under cultivation. Cultivated as millet or Hungarian grass.—A native of Europe, rarely spontaneous.

6. **S. composita** Kth. (Chapm. Fl. S. States, p. 578.) Culms smooth, 2 to 4 feet long; leaves 1 foot or more long, the fringed sheaths rough, hairy at the throat; panicle 6 to 12 inches long, loose, compound, tapering to the apex, the lower clusters spreading or scattered, ½ to 1 inch long; perfect flower, acute, with faint transverse lines. Much like *S. setosa*.—Dry, sandy soil, Florida, Apalachicola to Key West.

7. **S. macrostachya** H. B. K.? perhaps *S. magna* Griseb. (Kunth Enum. Plant, I, p. 154.) Culms 4 to 8 feet high, thick, smooth; leaves ½ to 1 inch wide, a foot or more long, very rough; spike 1 foot to 18 inches long, nearly cylindrical, tapering at the apex, very dense, the lower clusters scattered; fertile flower smooth, smaller than in the preceding bristles 1 or 2 to each spikelet, much longer than the clusters.—Swamps along the coast North Carolina to Florida and west to Mississippi. Confused by Dr. Chapman with *S. Italica*.

8. **S. setosa** Beauv. Agrost, p. 178. (*Panicum setosum* Trin.?) Culms 2 to 4 feet high, apparently annual, sometimes branched below, smooth; leaves often 1 foot long, three-fourths inch wide, sometimes scabrous; ligule ciliate, lower sheaths shorter than the internodes; panicle 6 to 10 inches long, not cylindrical, tapering to the apex erect or somewhat nodding, loose or somewhat dense, compressed, the erect, spreading branches ½ to 1 inch long; lower glume one-fourth, second glume three-fourths as long as the third, perfect flower acute, transversely rugose.—Texas, New Mexico, Arizona and Mexico. Resembles No. 6, but with smaller spikelets. Seems to pass gradually into the next species.

9. **S. caudata** R. & S. Syst. II. p. 495. Culms 2 to 3 feet high, apparently perennial, much branched, sometimes decumbent and rooting below; panicle cyl-

indrical or nearly so, dense or sometimes interrupted, 3 to 6 inches long, 3 to 4 lines thick; leaves narrow, 1 to 3 lines wide: spikelets as in the preceding species, bristles usually much shorter.—Texas to Arizona and Mexico.

10. **S. pauciseta** Vasey. This species differs from the preceding in the smaller and more slender culms, apparently annual, the much looser, shorter, few flowered spikes, smaller, shorter leaves, and smaller spikelets, and corresponds better to the figure of *S. caudata* of Pl. 96, Trin.—Texas (No. 2096 *C. Wright, Nealley*), also Mexico (No. 381 *Pringle*).

***Bristles downwardly barbed.*

11. **S. verticillata** Beauv. (Gray's Manual, 6th ed., p. 634.) Spike cylindrical, dense, 2 to 3 inches long, the clusters apparently whorled; bristles short, adhesive.—In cultivated ground, adventitious from Europe.

CENCHRUS Linn.

Spikelets as in Panicum, awnless, but inclosed 1 to 5 together in a globular and bristly involucre, which becomes coriaceous, and forms a hard, rigid, and deciduous bur; the involucres sessile in a terminal spike.

1. **C. tribuloides** Linn. (Gray's Manual, 6th ed., p. 634.) Annual; culms ascending, branching, 6 to 12 inches high; leaves flat; spike oblong, of 8 to 20 spherical heads; involucre more or less downy, armed above with stout, compressed, broadly subulate, erect, or spreading spines; bristles none, or usually several below the spines, spikelets 2- to 3-flowered.—Sandy soil, extensively distributed.

2. **C. echinatus** Linn. (Chapm. Fl. S. States, p. 578.) Culms erect or ascending, 1 to 2 feet high; leaves flat; spike cylindrical, 4 to 6 inches long, of 20 to 25 roundish involucres, downy, spiny above, and with a row of rigid barbed bristles above the base; 3- to 5-flowered; involucres purplish.—Field and waste grounds, North Carolina to Mexico.

3. **C. incertus** M. A. Curtis. (Chapm. Fl. S. States Suppl., p. 667.) Smooth, strict, nearly simple, erect or ascending, 2 to 3 feet long; leaves linear, folded; the lower sheaths longer than the internodes; spikes cylindrical, many-flowered, involucre naked and acute at the base, the 10 or 11 stout spines ciliate; spikelets geminate, smooth; sterile flower triandrous. (C. *strictus* Chapm.)—Sandy coast Florida to North Carolina. Description from Dr. Chapman's Southern Flora.

4. **C. myosuroides** H. B. K. (Chapm. Fl. S. States, Suppl. p. 667.) (*Panicum cenchroides* Ell.) Culms 4 to 8 feet high, erect; leaves long, rigid, flat, or becoming convolute toward the point; spikes cylindrical, 3 to 6 inches long, densely many-flowered; involucre small, 1-flowered, armed with 20 or more slender (not compressed) spines, as long as the spikelet.—South Florida, Georgia to Texas and westward.

PENNISETUM Pers.

Spikelets with one terminal perfect flower, and a second male or neuter one below it, solitary, or two or three together, closely surrounded by an involucre of usually numerous simple or plumose bristles which disarticulate from the pedicel with the spikelets. The spikelets crowded in a spike-like panicle, or on pedunculated spike-like branches. The lower empty glume is small, the second and third larger and longer than the perfect flower, the glume of which is thicker and more rigid; sterile flower consisting of a membranaceous palet.

1. **P. setosum** Rich. (Kth. Enum. Pl. I. p. 161.) Culm 4 feet high; leaves linear-acuminate, glabrous; spike cylindrical, dense, 6 to 7 inches long, involu-

cres sessile several of the bristles more than twice as long as the single spikelet; lower empty glume small (one-sixth as long as spikelet), second and third equaling the perfect flower, the latter linear-lanceolate.—Lastero Bay, Florida (*A. P. Garber*, 1878).

P. typhoideum Rich. (CAT-TAIL MILLET.) (*Penicillaria* Willd.) This species is frequently cultivated in the South for fodder.

STENOTAPHRUM Trin.

Spikelets 2-flowered, the terminal one perfect and fertile, the lower one male or imperfect, the lowest empty glume short and obtuse, the second the largest, the two flowering glumes rather smaller, palets of both flowers similar in texture. The spikelets embedded, singly or two or three together, in alternate excavations of the broad flattened rhachis of a spike-like panicle.

1. **S. Americanum** Schrank. (Chapm. Fl. S. States, p. 579.) (*Rottboellia dimidiata* Ell.) Culms flattened, erect, 6 to 12 inches high, from creeping root-stocks, smooth; leaves 2 to 6 inches long, obtuse, flat or folded, contracted at the base; spikes 2 to 5 inches long, lateral and terminal, pedunculate; fertile spike sessile; the upper glume 7-nerved, three times as long as the lower one; palet of the sterile flower coriaceous, like that of the perfect one. Along the coast in most tropical countries. South Carolina to Florida and west to Texas.

HYDROCHLOA Beauv.

Spikelets 1-flowered, in small, simple, monœcious spikes (½ to 1 inch long), mostly included in the sheaths of the upper leaves, 3 to 5 male spikelets in the terminal spikes, and a few female spikelets in the axillary spikes; stamens 6. Stigmas elongated.

1. **Hydrochloa Caroliniensis** Beauv. (Chapm. Fl. S. States, p. 549.) Spikelets 1-flowered, consisting of two nearly equal hyaline glumes, or one glume and a palet, as they are sometimes considered; leaves short, oblong-linear.—North Carolina to Florida and Mississippi.

LUZIOLA Juss.

Flowers monœcious, in separate spreading panicles, the staminate spikelets larger than the fertile ones. Spikelets 1-flowered, awnless, the male spikelets terminal on each branch. Stamens 5 to 11, anthers linear. Styles 2, short; flowering glume with many prominent nerves. Creeping, narrow-leaved aquatic or marsh grasses.

1. **Luziola Alabamensis** Chapm. Fl. S. States, p. 584. Culms 4 to 6 inches high, simple, rooting at the lower joints; leaves few, the lower much exceeding the culm, the elongated purple sheath inclosing the base of the panicle, the latter few flowered, 1 to 3 inches long, the male and female on separate culms; glume and palet of male spikelets lanceolate, 7-nerved; those of the pistillate spikelets ovate-lanceolate, 11- to 13-nerved; grain smooth.—Brooklyn, Ala., also Mobile, Ala. (*Dr. Mohr*).

2. **L. Peruviana** Juss. (Persoon's Synopsis, II. p. 575). Culms creeping and rooting at the lower joints; flowering culms erect, 3 to 10 inches high; radical leaves often 12 inches long, narrow; male flowers much larger than the female ones, white; female panicles spreading, 1 to 2 inches long. In low ditches and low grassy lands.—Louisiana (*A. B. Langlois*). Mr. Langlois says it is attractive all summer by its fine white male spikes.

ZIZANIA Linn.

A reed-like aquatic grass, 6 to 10 feet high, with broad leaves 2 to 3 feet long; panicles often 2 feet long, the long branches somewhat appressed above, spreading below, the upper ones pistillate, the lower male; the female spikelets almost subulate, long-awned, the male spikelets awnless. Fruit linear, slender, ½ inch long.

1. **Zizania aquatica** Linn. (WILD RICE, INDIAN RICE, WATER OATS.) (Gray's Manual, 6th ed., p. 635.) Annual, culms 5 to 10 feet high, leaves linear-lanceolate; panicle ample, pyramidal.--Swampy borders of streams and in the shallow muddy borders of lakes. Very widely diffused, New England to Texas and Forida and northwestward to Minnesota.

ZIZANIOPSIS Doell. & Asch.

Tall, aquatic grasses with the habit of ZIZANIA, the perfect spikelets terminating the branches of the spreading panicle, the male spikelets at the base of each branch. Fruit a globular nut, with a hard, shining, easily separable pericarp. Stigmas united.

1. **Z. miliacea** Doell. & Asch. Culms stout, 4 to 8 feet high; leaves long (2 feet), 1 inch wide or more; panicle 1 to 2 feet long, the branches at first oppressed, becoming spreading. In ditches and wet grounds.—Southern States to Texas.

ORYZA Linn.

Spikelets * elongated, much compressed laterally, empty glumes of two small scales or bristles, and underneath these, two more minute rudimentary empty glumes. Flowering glume conduplicate and keeled, usually awned; palet narrow, 1-nerved. Stamens 6. Fruit long-obtuse, closely enveloped by the fruiting glume, and compressed laterally, with two lateral furrows. Embryo short, curved.

1. **O. sativa** Linn. Sp. Pl. p. 465. (CULTIVATED RICE). Panicles contracted and rough, flowering glumes prominently 5-nerved.

LEERSIA Swartz.

Spikelets 1-flowered, flat, articulated on short pedicels along the slender branches of a terminal panicle. Glumes 2, strongly compressed or conduplicate, awnless, bristly ciliate on the keels, the lower one much the larger. No palets. Stamens 1 to 6. Stigmas 2; styles short, distinct. Perennial grasses, the leaves and sheaths usually rough with minute prickles or bristly hairs.

1. **L. hexandra** Swartz. (Chapm. Fl. S. States, p. 549.) Culms 2 to 6 feet high, slender, often branching below; leaves 4 to 6 inches long, rather rigid, variable in width, sheaths scabrous; panicle exserted, erect, contracted, 3 to 5 inches long; spikelets 2 lines long, lanceolate to oblong, acute, margins short, fringed, hispid on the keel; stamens 6, styles 2, distinct.—Low grounds near the coast.

2. **L. oryzoides** Swartz. (WHITE GRASS, CUT-GRASS). (Gray's Manual, 6th ed., p. 635.) Culms erect or decumbent, rather stout, branching or simple, 3 to 4 feet high, leaves light green, very rough; panicle rather large and diffusely branched, 6 to 18 inches long; spikelets about 2 lines long, oval or oblong, hispid-ciliate on the keel, very short-pointed, short-pediceled; stamens 3.—Common in wet places.

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* This foreign species is introduced because so extensively cultivated in the Southern States.

3. **L. Virginica** Willd. (WHITE GRASS). (Gray's Manual, 6th ed., p. 635.) Culms slender, decumbent, branching below; panicle simple, narrow, 3 to 6 inches long, branches alternate, slender, the lower branches sparingly divided, naked below; spikelets appressed, oblong, 1½ lines long, short-pointed, smooth or sparingly ciliate on margins; stamens 2.—Wet or moist woods, common.

4. **L. monandra**, Swartz. (Chapm. Fl. S. States, Suppl., p. 661). Culms slender, 1½ to 2 feet high; leaves small, sheaths rough; panicle small, simple, becoming spreading, branches capillary, alternate, distant, flowering near the extremity; spikelets pale, semiovate, obtusish, less than a line long, smooth; stamen 1.—In moist woods, Texas (*G. C. Nealley*).

PHALARIS Linn.

Spikelets crowded in a clustered or spike-like panicle, 1-flowered; glumes 5, the outer large, the inner pair smaller and imperfect or scale-like, one on each side the terminal or perfect flower, the fifth being the flowering glume of the perfect flower. The glume-like palet one nerve. Outer glumes 3-nerved, compressed, keeled, boat-shaped; second pair linear; perfect flower shorter than spikelet, the glume becoming coriaceous or cartilaginous. Grain smooth and shining.

* *Glumes not winged on the back or slightly winged.*

1. **P. arundinacea** Linn. (REED CANARY GRASS). (Gray's Manual, 6th ed., p. 639.) Culms stout, 2 to 4 feet high; leaves flat, about one-half inch wide; panicle 3 to 5 inches long, narrow, the short branches spreading during anthesis, becoming appressed; spikelets 2 lines long; outer glumes acute; the imperfect pair one-half as long as the perfect flower.—Widespread in northern or mountainous districts.

2. **P. Lemmoni** Vasey. Culms rather slender, 1½ to 3 feet high; leaves narrow, acuminate, ligule conspicuous, 3 lines long; panicle spike-like, 2 to 3 inches long, nearly cylindrical, dense; outer glumes 2 to 2½ lines long, acute to acuminate; second pair very short (about ½ line) somewhat unequal, with short pedicels; flowering glume lanceolate, acuminate, little shorter than the outer ones, pubescent; palet nearly as thick as its glume and a little shorter.—Santa Cruz, California (*J. G. Lemmon, Dr. Anderson*).

3. **P. amethystina** Trin. (Bot. Cal. II. p. 265.) Culm stout, tufted, 2 to 8 feet high, from a perennial root; leaves broad, the sheaths often purplish; panicle spike-like, oblong, 1 to 2 inches long, dense, usually purplish; spikelets 3 to 3½ lines long; outer glumes narrowly winged, straight, acutish; inner pair of glumes hairy, more than half as long as the perfect flower, which is 2 lines long or more.—California to Oregon.

* * *Glumes decidedly winged on the back.*

4. **P. intermedia** Bosc. (Bot. Cal. II. p. 264.) (*P. Americana* Ell.) Culms variable, stout or slender, 1½ to 4 feet high, smooth; leaves short, often glaucous; sheaths more or less inflated; spike-like panicle 1 to 4 inches long, ovoid to cylindrical; spikelets 2½ lines long; outer glumes strongly winged on the keel, acute; second pair of glumes linear, hairy, about half the length of the perfect one, the latter long-pointed, hairy, and one-third shorter than the outer glumes.—Texas to California.

Var. MICROSTACHYA (P. *microstachya* DC.) Culms slender, 6 to 18 inches high; leaves short, the uppermost inflated; spike-like panicle ½ to 1 inch long, oval; outer glumes lanceolate, slender-pointed, broadly-keeled, twice as long as the hairy, ovate flower.—Florida to Texas.

5. **P. angusta** Nees. (Fl. Brasil. II. p. 391.) (*P. intermedia*, var. *angusta* Chapm.) Culms stout, 2 to 3 feet high; panicle cylindrical, dense, 3 to 6 inches long, nar-

row; spikelets 2 lines long; outer glumes winged on the keel, abruptly acute, serrulate on the keel, second pair linear, slightly unequal, one-third as long as the perfect flower, the latter one-third shorter than the outer glumes, and not long-pointed as in *P. intermedia*.—Louisiana, Texas to California.

6. **P. Canariensis** Linn. (CANARY GRASS.) (Gray's Manual, 6th ed., p. 639.) Culms 1 to 3 feet high; leaves flat, the upper sheaths much inflated; panicle 1 to 1½ inches long, ovoid, very dense; outer glumes broad, with a conspicuously winged keel, white on the margin, with a distinct green line within; second pair of glumes small, lanceolate, smooth; perfect flower silky-hairy.—Introduced and escaped from cultivation. The seed is a common and favorite bird seed.

ANTHOXANTHUM Linn.

Panicle spike-like, narrow; spikelets apparently 3-flowered, only the terminal one perfect, outer empty glumes unequal, herbaceous; those of the 2 imperfect flowers clothed with brown hairs, awned from the lobed apex; flowering glume and 3-nerved palet short membranaceous. Stamens 2.

1. **A. odoratum** Linn. (SWEET VERNAL GRASS). (Gray's Manual, 6th ed., p. 630.) Culms erect, slender, 1 to 2 feet high; leaves flat, hairy; sheaths often hairy; ligule short, obtuse; panicle 1 to 4 inches long, interrupted below; spikelets 3 to 4 lines long; inner pair of sterile glumes 2-lobed, long-awned; perfect flower equal to the inner glumes.—Introduced from Europe. Very fragrant.

HIEROCHLOE Gmelin.

Panicle open and spreading; spikelets 3-flowered, compressed, the lower two staminate only, the upper or terminal one perfect, outer empty glumes equal, scarious, 3-nerved; flowering glumes much thicker, chartaceous, 5-nerved, those of the male flowers sometimes short-awned; that of the perfect flower awnless; male flowers with 3 stamens, perfect flowers with 2 stamens; palet of the male flowers 2-nerved, that of the perfect flower 1-nerved.

The dried plants have a vanilla-like odor, on which account they were formerly strewn before church doors on holidays.

H. macrophylla Thurb. (Bot. Cal. II. p. 265.) Culms 2 to 3 feet high, tufted, leaves 12 to 18 inches long, 4 to 8 lines broad, scabrous above and on the margins; panicle 4 to 6 inches long, the branches somewhat distant, in pairs; spikelets 2½ lines long; glumes obtuse, those of the male flowers fringed on the margin, notched at the broad apex, and often with a slight awn; glume of the perfect flower smooth and shiny below.—California (*Bolander*) and Oregon (*Howell*).

2. **H. borealis** R. & S. (VANILLA GRASS). (Gray's Manual, 6th ed., p. 639.) Culms 1 to 2 feet high; from a creeping root-stock; leaves (all but the lower) with short blades and long sheaths; panicle pyramidal, 2 to 4 inches long, branched in pairs, flowering above the middle; outer glumes acuminate and longer than the flowers; glumes of the male flowers acute, and sometimes mucronate or bristle-pointed.—Moist ground chiefly northward and northwestward; New England to Wisconsin, on the mountains and northward to Alaska.

3. **H. alpina** R. & S. (Gray's Manual, 6th ed., p. 639.) Culms 10 to 18 inches high; lower leaves very narrow; panicle 1½ to 2 inches long, the branches few flowered; outer glumes 3 lines long, obtuse; glumes of one of the male flowers long awned below the middle, that of the other short awned from near the apex.—Alpine mountain tops, New York, New England, and northward.

4. **H. pauciflora** R. Br. (Chloris Melville, p. 35.) Root creeping, culms erect,

leafy below, radical leaves subulate, margin involute, those of the culm shorter than the loose sheaths; raceme erect, simple; spikelets ovate; scarious glumes ovate, very smooth, the lower one smaller; the flowering glume of the upper male flower emarginate-setigerous, the seta very short; terminal flower awnless.—Melville Island (*Parry*).

ARISTIDA Linn.

Spikelets 1-flowered, in a spicate, or an open, branching panicle, generally on filiform pedicels; empty glumes mostly unequal, often bristle-pointed; flowering glume narrow, rolled around the flower, and terminating with a trifid awn, rarely the lateral branches of the awn wanting. Palet small, thin, enclosed in the flowering glume.

§ 1. *Upper portion of flowering glume not articulated to lower portion.*

* *Panicle close and spike like, awns unequal, lateral ones minute, erect, the long middle awn horizontal or turned back.*

1. **A. ramosissima** Engelm. (Gray's Manual, 6th ed., p. 640.) Culms much branched, 1 to 2 feet high, spikes terminating the main and lateral branches; branches of the panicle 3 to 4 inches long, mostly in twos, erect; spikelets about 1 inch long, without the awn; lower glume 6 to 8 lines long, 5-nerved; upper one 8 to 10 lines long, 3-nerved, toothed, and slightly awned at apex; middle awn nearly an inch long, becoming strongly hooked-recurved; lateral awns varying from 1 to 2 lines long, to almost deficient.—Illinois, Missouri and Kentucky.

2. **A. basiramea** Engelm. (Gray's Manual, 6th ed., p. 640.) Culms tufted, much branched, 1 foot high; panicles 3 to 4 inches long, the branches erect-appressed, in pairs below, longer pediceled than in the preceding species; lower glume about 6 and upper about 8 lines long; middle awn 6 to 9 lines long, about twice coiled and horizontal, lateral awns 3 to 6 lines long, very slender and erect.—Missouri, Wisconsin, Nebraska and Minnesota.

3. **A. dichotoma** Michx. (Gray's Manual, 6th ed., p. 640.) Culms 6 to 18 inches high, much branched, the branches rather long, panicle 1 to 3 inches long, strict, branches of panicle in twos below, few flowered; glumes slightly unequal, about 3 to 4 lines long, little longer than flowering glume; middle awn once or twice coiled, 3 to 4 lines long, and reflexed; lateral awns one-half to 1 line long.—Throughout the country east of the Missouri River.

** *Awns nearly equal.*

4. **A simplicifolia** Chapm. Fl. S. States, Suppl. p. 662. Culms slender, about 2 feet high, simple or sparingly branched, leaves flat; racemes 6 to 9 inches long, loosely flowered, 1 or 2 at each node; glumes nearly equal, awn-pointed, rough on the keel, longer than the flowering glume, middle awn circular, recurved near the base, thick and scabrous, about 8 lines long, lateral awns more slender, horizontal, 6 lines long.—Florida (*Chapman*) and Alabama (Dr. *Mohr*).

Var. TEXANA. Spikelets smaller, lateral awns 1 to 2 lines long.—Texas.

5. **A. gyrans** Chapm. Fl. S. States, Suppl., p. 662. Culms slender, 1½ to 2 feet high, simple; leaves convolute-filiform; panicle simple, 6 inches long, the few simple branches appressed; lower glume truncate, short awned, as long as the flowering glume, the upper a third longer, attenuate; flowering glume long stipitate, the awns nearly equal, curved, twisted together at the base.—Florida and Cuba (No. 3430 *Wright*).

6. **A. gracilis** Ell. Bot. S. Car. i. p. 152. (Gray's Manual, 6th ed., p. 640.) Culms slender, 1 to 2 feet high, simple or much branched, panicle about 6 inches long, spike-like, branches few flowered, almost sessile; glumes nearly equal, 3 to 4 lines long; middle awn 3 to 6 inches long, lateral ones from 1 to 3 or more inches long; the awns very variable in length.—Widely diffused, Massachusetts to Texas.

7. **A. Nealleyi.** (*A stricta* var. *Nealleyi*, Contr. U. S. Herb. I. p. 55.) Perennial, culms slender, erect, 1½ to 2 feet long, leaves setaceous involute, 3 to 4 inches long, 3 to 4 on the culm, naked above; panicle erect, strict, about 4 incles long, few flowered; glumes nearly equal, 3½ to 4 lines long; flowering glume about 6 lines long, the neck twisted 2 or 3 rounds; awns nearly equal, slender, erect-spreading, 6 lines long.—Texas, Colorado City to Valverde County (*Nealley*).

8. **A. stricta** Michx. (Gray's Manual, 6th ed., p. 640.) Culms 2 to 3 feet high, erect, rigid, simple, densely tufted from a perennial root; leaves involute-setaceous, rigid, more or less hairy at the base; panicle spike-like, erect, narrow, rather dense, about 1 foot long; the upper glumes 5 to 6 lines long, rather longer than the lower, both awn pointed; flowering glume 4 lines long, with a short acute stipe; awns nearly equal, 5 to 6 lines long, or the middle one one-third longer, all recurved when mature.—In pine barrens, Virginia to Mississippi.

Var. CONDENSATA. (*Aristida condensata* Chapm.) Culms stout, simple, 2 or 3 feet high; leaves long, flat below, becoming involute; panicle branches rather longer, flowering glume 3 lines long.—Florida (*Dr. Chapman*).

9. **A. spiciformis** Ell. Bot. S. Car. I. p. 141. Culms 1 to 2 feet high, simple, rigid, erect; leaves convolute, rigid, the radical ones more than a foot long, the cauline 6 to 10 inches; panicle spike-like, 4 to 8 inches long, oblong or cylindrical, densely flowered, branches fascicled, crowded; empty glumes unequal, each awn-pointed, and including the awns, 7 to 10 lines long, the body very unequal, the lower 2, the upper 4 or 5 lines long; floral glume very slender, linear, nearly 1 inch long to the division; awns nearly equal, widely spreading, about 1 inch long.—South Carolina to Florida.

10. **A. palustris** Vasey. (*A. virgata* var. (?) *palustris* Chapm. Fl. S. States, p. 555.) Perenial, tufted, culms 3 to 5 feet high, rigid, erect; leaves very long, 1 to 2 feet, sometimes involute, flat below; panicle 1½ to 2 feet long, narrow, spike-like, branches appressed, the lower 2 to 3 inches long, sessile; glumes nearly equal, about 5 to 6 lines long, the lower 3-nerved, upper 1-nerved, flowering glume 4 lines long, with a slender terete stipe ½ to ¾ line long, lateral awns about 8 lines long, middle awn 10 to 12 lines, all diverging.—Margins of pine-barren ponds, Florida.

11. **A. virgata** Trin. Acta Petrop. 1829, p. 86. Perennial? Culms 1½ to 2 feet high; simple leaves, narrowly linear, flat, 3 to 6 inches long; panicle spike-like, narrow; lower branches appressed, somewhat distant, in twos or threes, one short, the other 1 to 2 inches long; empty glumes, 3 to 3½ lines long; flowering glume, 2 lines long; smooth, stipe very short and sharp-pointed; middle awn about 6 lines long, lateral ones about 4 lines.

This species was included in Chapman's Flora of the Southern States, but has not recently been in the South, neither has it been recognized at the North, although Trinius describes it as from Philadelphia, but specimens collected at Point Norris, New Jersey, last summer, by Mr. Jesse H. Holmes, answer fairly to this description and seem to be intermediate between *A. gracilis* and small forms of *A. purpurascens* or of *A. stricta*.

12. **A. bromoides** H. B. K. Nov. Gen. I. p. 100. (*A dispersa* Trin. var. *bromoides*). Culms 10 to 18 inches high, commonly much branched, forming close tufts, slender; radical leaves few and short, those of the culm 2 or 3, 1 or 2 inches long, involute-setaceous, sheaths shorter than internodes; panicle 1 to 3 inches long, spike-like, erect or secund, the branches solitary or clustered, flowering nearly to the base; glumes unequal, the lower 2 lines and upper 3 to 4 lines long, 1-nerved; flowering glume 3 to 4 lines long with white hairy callus; awns about equal, 3 to 5 lines long.—Texas, New Mexico, Arizona, South Carolina and Mexico.

This is a pretty distinct form in general, but frequently becomes large and branching and verges into *A. dispersa* Trin.

13. **A. Reverchoni** Vasey. Bull. Torr. Club, XIII. p. 52. Perennial, culms erect, simple, about 1½ feet high, radical leaves rather numerous, 3 to 6 inches long, com-

monly curved, cauline, about 3, similar, panicle spike-like, close, 4 to 6 inches long, purple, lower branches mostly in pairs, unequal, the longer about 1 inch long, all appressed; lower glume 4 lines and upper about 6 lines long, flowering glume 5 to 6 lines long, gradually tapering above, smooth; awns 8 to 10 lines long, smooth, nearly equal.—Texas (*J. Reverchon, G. C. Nealley*).

Var. AUGUSTA, panicle narrow, otherwise nearly the same.—Comanche Peak (*Reverchon*), Texas (*G. C. Nealley*). This species approaches closely *A. purpurea*, but appears to be sufficiently distinct.

* * * *Panicle loose, branches mostly short.*

14. A. purpurascens Poir. (Gray's Manual, 6th ed., p. 641.) Perennial? Culms 2 to 3 feet long, smooth, rarely branching; leaves long, becoming involute; panicle spike-like, erect or nodding, 10 to 18 inches long, closely flowered, lower branches 1 to 2 inches long, appressed; lower glume about 5 lines, upper 4 lines long, both 1-nerved, flowering glume 3 lines long, spotted; middle awn about 1 inch long, lateral ones 9 to 10 lines; stipe short, narrowed to the sharp point.—Massachusetts to Kansas, south to Texas and Florida.

Var. MINOR Vasey. Culms more branching, panicle thinner and more flexuous, flowers and awns rather shorter.—Southern States to Texas.

15. A. oligantha Michx. (Gray's Manual, 6th ed., p. 640.) Culms 1 to 2½ feet high, tufted, from a perennial root, much branched, panicles lateral and terminal, a nearly simple loose raceme 3 to 5 inches long, the branches rarely sessile, the lower in pairs, few-flowered; empty glumes nearly equal, 10 to 12 lines long, floral glume 7 to 9 lines long, long-tapering above, awns capillary, 1½ to 3 inches long.—Maryland to Kansas, south to Florida and Texas, also on the Pacific coast.

16. A. lanata Poir. (Gray's Manual, 6th ed., p. 641.) Perennial, culms tall and stout, 2 to 4 feet long, leaves flat, 1 to 2 feet long, long-pointed, rough on upper side, sheaths woolly; panicle 1 to 2 feet long, nodding, loosely spike-like, with the branches somewhat spreading, the lower unequal, 1 to 2 inches long, rather remote, somewhat woolly in the axils; lower glume 7 to 8 lines long, upper one 4 to 4½ lines, both 1-nerved; flowering glumes 5 lines long, stipe short, smooth, middle awn spreading, 9 lines long, lateral ones about 5 lines long.—Delaware to Florida.

17. A. dispersa Trin. & Rupr. Gram. Agrost., p. 129. Annual? Culms branching, of variable height, panicle 1 to 6 inches long, contracted, generally purplish, lower branches mostly in twos or threes, unequal (½ to 1 inch), flowering nearly to the base; glumes unequal or nearly equal, lower 3 to 4 lines, upper 4 to 5 lines long; flowering glume about 3 lines; awns nearly equal, 5 to 8 lines long, spreading.—Texas to California.

18. A. purpurea Nutt. (Gray's Manual, 6th ed., p. 640.) This species was defined by Nuttall in the Trans. Amer. Philos. Society, Vol. v. new series, 1837, and is practically as follows: Panicle rather erect, slender; empty glumes aristulate, bifid at apex; awns capillary, very long; leaves short scabrous; perennial, leaves narrow, short and scabrous, ligule pilose; culms about 1 foot high, panicle many flowered, a little spreading, branches capillary, flowers commonly in pairs, bluish-purple; one of the glumes nearly twice the length of the other, the longer glume exceeding the flowering glume; awns equal, capillary, nearly three times the length of the flowering glume and scabrous, the flowering glume minutely stipitate.—On the grassy plains of the Red River in arid situations.

This is one of the most variable species we have, and has a wide distribution in the West and Southwest. Our present acquaintance with the genus requires its division into several varieties; indeed Trinius found it necessary to make two varieties, and one or two more are needed to complete the species.

Var. FENDLERIANA. (*A. Fendleriana* Steud.) Perennial, culms tufted, 8 to 12 inches high, very slender and erect, branching near the base; radical leaves abundant, nearly capillary, involute, 3 to 4 inches long, those of the culm about 3,

1 or 2 inches long; panicle 3 to 4 inches long, thin; branches erect or becoming spreading, few-flowered, mostly in twos below, with short capillary pedicels; empty glumes variable, 4 to 6, 4 to 8, or 5 to 10 lines respectively; awns nearly equal, capillary 1 to 2½ inches long.

Var. HOOKERI Trin. More robust, 1½ feet high, with coarser and longer leaves, panicle more spreading than in the preceding and more numerously flowered; spikelets larger, glumes longer, awns varying 2½ to 4½ inches long.

Var. CALIFORNIA Vasey. Culms tall, 2 to 2½ feet high, with long leaves (often 1 foot long), panicle flexuous, 5 to 7 inches long, lower branches often 5 to 7 at the nodes, 1 to 3 inches long, spreading, capillary, and naked below; empty glumes 3 to 6 lines respectively, awns about 2 inches long.—Western Texas to California.

Var. MICRANTHA. Culm 1 to 1½ feet high, slender, flexuous, leaves much as in 1st var., but culms usually decumbent at base and branching, the branches mostly in twos or threes, capillary, few-flowered, spreading or reflexed, spikelets usually smaller than in any other form (lower 3 to 4, upper 4 to 6 lines long).—Western Texas.

19. **A. Arizonica** Vasey. Bull. Torr. Club, XIII. p. 27. Perennial, culms 2 to 2½ feet high, erect, unbranched, stout; leaves flat, becoming involute, 6 to 12 inches long; panicle strict erect, 6 to 10 inches long, the branches mostly single or in twos, erect, about 2 inches long, each 2- to 5-flowered; spikelets approximate, sessile, or nearly so; empty glumes nearly equal, 6 to 8 lines long, the lower one 3-nerved, awn pointed; flowering glume 7 to 8 lines long, twisted below the awns, hispid, awns nearly equal, spreading, 10 to 12 lines long.—New Mexico and Arizona. Differs from *A. purpurea* in its larger size, close, rigid panicle, and nearly equal glumes, the lower one 3-nerved.

* * * * *Panicles spreading, branches longer.*

20. **A. Havardii** Vasey. Bull. Torr. Club, XIII. p. 27. Culms about 1 foot high, erect, rather slender; leaves setaceous, 3 to 6 inches long, about 6 on the culm; glumes nearly equal, about 5 lines long, 1-nerved, narrow, acuminate; flowering glume about as long, with a short hairy callus, tapering to the apex; awns erect, spreading, nearly equal, 6 to 7 lines long; the panicle usually 4 to 6 inches long, open, the branches at first erect, in age becoming horizontal or reflexed, pyramidal, in pairs or fascicled below; lower branches 2 inches long, naked below, spikelets rather distant.—Western Texas (*Dr. Havard*) and New Mexico. Possibly this includes *A. Palmeri*.

21. **A Humboldtiana** Trin. & Rupr. Gram. Agrost., p. 118. (*A. divaricata* H. B. K.) Perennial, tufted, culms erect, simple, 1 to 2 feet long; leaves narrow or convolute, rather short and rigid, in twos and threes, the lower often 5 or 6 inches long, flower-bearing above the middle, widely spreading except those included in the sheath, few-flowered; empty glumes nearly equal, awl-pointed, 5 to 6 lines long; flowering glume slightly shorter; awns subequal, lateral, 4 to 5 lines, middle one 6 to 8 lines long.—Texas to Southern California and Mexico.

Var. MINOR. Smaller, culms about 1 foot high; panicle exserted, 5 to 6 inches long, pyramidal, branches 2 to 3 inches long; empty glumes 4 to 5 lines long, awns nearly equal, 4 to 5 lines long.—Texas, Arizona, to California.

* * * * * *Lateral awns minute or wanting.*

22. **A Schiediana** Trin. & Rupr. Gram. Agrost. p. 120. Perennial, culms 2 to 2½ feet high, erect; leaves filiform-convolute, 6 to 12 inches long, glabrous; panicle ½ to 1 foot long, depauperate, the branches solitary or in pairs, distant, 3 to 5 inches long, suberect or widely spreading, rigid, often one-sided, flowering beyond the middle; empty glume nearly equal, 4 to 5 lines long; flowering glume 6 to 7 lines long, the apex tapering and twisted; lateral awns minute, one-half line long or less, erect the middle one spreading, 4 to 6 lines long.—Texas, New Mexico to Mexico.

23. **A. divergens.** (*A. Schiediana* var. *minor* Vasey, Torr. Bull. XIII. p. 28.) Culms 12 to 15 inches high, erect, simple; leaves involute, 6 to 10 inches long; panicle 5 to 7 inches long becoming pyramidal, sheathed at base by the uppermost leaf; branches at first erect spreading, becoming divergent, 1 to 3 inches long, solitary above, the lower divided at the base into 3 or 4 nearly equal divisions (appearing verticillate), again divided above the middle; spikelets diverging; empty glumes 3 to 4 lines long; floral glume 5 lines, becoming somewhat twisted in age; the lateral awns wanting or nearly so; middle awn 5 to 6 lines long, straight.—Texas to Arizona.

Smaller and less robust than *A. Schiediana*, not having the long naked branches of that species.

24. **A. scabra** Kth. (Chapm. Fl. S. States, Suppl., p. 663.) Culm without nodes, except at the base, from creeping root-stock 1½ to 3 feet high; leaves radical, setaceously attenuated, panicle large, spreading; the branches single or 2 to 5 in a cluster, long (6 to 8 inches), naked below; spikelets appressed; glumes awn-pointed, about 5 lines long; floral glumes about 5 lines long; middle awn 9 to 12 lines long; the lateral ones 2 to 6 lines long; stamens 2.—Florida (*Dr. Chapman*). Apparently the same from Mexico. Remarkable for its long scapiform culms. Kunth's species is described as without lateral awns.

25. **A. Orcuttiana** Vasey. Bull. Torr. Club, XIII. p. 25. Culms about 2 feet high, stout below, above becoming slender, very leafy; leaves near the base with loose open sheaths and rather broad blades, the upper narrow, becoming involute, 5 to 8 inches long or more; panicle, long and open, 4 to 5 inches long; branches rather distant, mostly single, flexuous, the lower ones about 3 inches long, with the lower half naked; lower glume about 5 lines long, the upper one-quarter shorter; flowering glume with the awn 9 lines long, the lateral awns obsolete or nearly so; the main awn bent near the middle and twisted below.—Southern California (*C. R. Orcutt*) and Arizona (*M. E. Jones.*) The panicle is small for the size of the plant, and comparatively few flowered. It approaches *Aristida Schiediana.*

26. **A. Floridana** Chapm. (*Streptachne Floridana* Chapm.; Fl. S. States, p. 554.) Culms 2 feet high, simple, slender, erect; leaves long, filiform, convolute, smooth; sheaths hairy at throat; panicle 1 foot long, narrow, erect, the branches in pairs, scattered; spikelets short-stalked; empty glumes equal, linear, purple, 1-nerved, the lower awn-pointed; palet (floral glume) raised on a slender bearded stalk, linear-subulate, gradually tapering into the long compressed curved awn; no lateral awns.—South Florida (*Dr. Blodgett*).

§ 2. *Awns united and articulated to the floral glume.*

27. **A. tuberculosa** Nutt. (Gray's Manual, 6th ed., p. 641.) Culms from an annual root, 10 to 18 inches high, branched below; panicles racemose, loose, rigid, about 6 inches long; the branches rather distant, the lower in pairs, one short and few-flowered, the other elongated (2 to 3 inches long) and many-flowered; empty glumes 1 inch long, awn-tipped; floral glume about 10 lines long to the separation of the awns, a rather long, sharp, densely-hairy stipe, and a distinct articulation at its apex, the proper glume about 5 lines long, the prolongation above twisted 3 or 4 coils to the division of the nearly equal bent and divergent (sometimes reflexed) awns, which are 1½ to 2 inches long.—Massachusetts to Minnesota and southward.

28. **A. desmantha** Trin. & Rupr. Gram. Agrost. p. 109. Culms 1½ to 2 feet high, much branched; leaves convolute, 6 to 10 inches long, panicle rather narrow, erect, 4 to 6 inches long; the branches mostly in twos, one short, the other longer (2 to 3 inches), naked below, the spikelets fascicled above, short-pediceled; empty glumes nearly equal, 7 to 8 lines long, subulate-awned at apex; floral glume 4 to 5 lines long, including the sharp stipe, and to the articulation; the junction of the awns near or at the articulation, and the curving and spreading awns about 1 inch long.—Texas and Indian Territory.

29. **A. Californica** Thurb. Bot. Cal. II. p. 289. (*A. Jonesii* Vasey.) Annual; culms 5 to 10 inches high, densely tufted; much branched; often geniculate below;

often pubescent on the lower sheaths; leaves short, 1 to 2 inches long, narrow, racemose, the branches short and 2-flowered; empty glumes very unequal, the lower 4 to 5, the upper 6 to 7 lines long, floral glume 3 lines to the articulation, including the very slender sharp stipe; awn slender, capillary 6 to 9 lines long and twisted to the division of the equal 1½ to 2 inches long awns.—Southern California to Arizona and Mexico. Said to be known to the Mexicans as "Hare's grass."

Var. FUGITIVA, differs from the type chiefly in the lower and more condensed habit, and in the longer empty glumes. Late in the season it is loosened from the sand and blown about by the wind.—Colorado Desert (*C. R. Orcutt*).

STIPA Linn.

Spikelets 1-flowered, terete, spicate or paniculate. Outer glumes membranaceous, keeled; flowering glume narrow, coriaceous, rigid, involute, with a simple, twisted awn from the apex; palet usually small and inclosed by the flowering glume. Stamens generally 3. The flowering glume has a hardened, often sharp-pointed and bearded pedicel or stipe at its base.

A. Panicle narrow, branches short.

1. **S. Kingii** Thurb.
2. **S. tenuissima** Trin.
3. **S. viridula** Trin.
4. **S. occidentalis** Thurb.
5. **S. stricta** Vasey.

B. Panicle more open, branches erect.

6. **S. Stillmani** Bolander.
7. **S. coronata** Thurb.
8. **S. speciosa** Trin. & Rupr.
9. **S. Parishii** Vasey.
10. **S. Scribneri** Vasey.

C. Panicle open, lower branches spreading.

11. **S. comata** Trin. & Rupr.
12. **S. spartea** Trin.
13. **S. pennata** Linn.
14. **S. leucotricha** Trin.
15. **S. setigera** Presl.
16. **S eminens** Cav.
17. **S. avenacea** Linn.
18. **S. flexuosa** Vasey.
19. **S. Bloomeri** Boland.
20. **S. caduca** Scribn.
21. **S. Pringlei** Scribn.
22. **S. Richardsoni** Link.
23. **S. Mongolica** Turcz.

A. Panicle narrow, branches short.

1. S. Kingii Thurb. Bot. Cal. II. p. 287. Culms tufted, 6 to 20 inches high, covered below by the remains of numerous sheaths, slender, smooth, with but two nodes near the base; radical leaves half to two-thirds as long as the culms, setace-

ously involute, minutely scabrous; culm leaves two, the upper short; ligule 1 line long, acute, often cleft; panicle narrow, 2 or 3 inches long, the branches in twos or threes, the lower 1 inch or more long, erect, few-flowered; spikelets 2 lines long; empty glumes hyaline, purple-tinged, the upper about 2 lines long, the lower a little shorter; flowering glume less than 2 lines long, sparsely pubescent, and with a short, hairy callus; awn 6 lines long, bent below the middle, scabrous and persistent; palet equaling the flowering glume, hairy at the apex.—California (*Bolander's* distrib., No. 6097).

2. **S. tenuissima** Trin. Act. Petrop. 1836, p. 36. Culms densely tufted, 2 to 2½ feet high, filiform, with 2 to 3 distant nodes; leaves filiform, scabrous, the radical tufts equaling the culm, the cauline leaves similar, the uppermost sheathing the base of the panicle; the panicle narrow, 6 to 9 inches long, slender, the branches rather distant, the lower ones in two or threes, 1½ to 2 inches long, flowering nearly to the base; empty glumes unequal, about 3-nerved, the lower 5 to 6 lines long, the upper 3 lines, including, in both, the long fine point; flowering glume about 1 line long, minutely punctate, enlarged above, with the apex constricted and crowned with a few hairs; near the base and on the very short stipe, sparsely white-hairy; the slender, flexuous awn, 2 to 3 inches long.—Texas, New Mexico, Mexico and probably Arizona.

3. **S. viridula** Trin. (Gray's Manual, 6th ed., p. 642.) (*S. parviflora* Nutt.: *S. spartea* Hook). Culms 1½ to sometimes 5 feet high, leaves all involute-setaceous at the apex; in the large forms the blade is flat and 1 or 2 feet long; in smaller forms often involute throughout, smooth, pubescent or scabrous; ligule very short; sheaths half the length of the internodes or less; panicle 4 to 18 inches long, narrow, loose, the short, erect rays in twos or threes, or even in fives; spikelets 4 to 5 lines long (excluding the awns) on shorter pedicels; empty glumes nearly equal, 3 to 5 lines long, ovate to lanceolate, bristle-pointed, the lower 5-, the upper 3-nerved, sometimes purple-tinged; flowering glume fusiform to linear-oblong, one-fourth shorter than the empty glumes, pubescent with short scattered hairs which at the apex form a thin crown, and with 2 very minute teeth, the callus short; awn from less than 1 inch to 1½ inches long, slender, flexuous, pubescent to plumose below, and scabrous above, usually twice bent, at length deciduous; palet more than half as long as its glume; anthers naked.

The above description is somewhat modified from Dr. Thurber's description in Botany of California. The species, as he says, is "very variable in the size of the culm and character of the panicle, which is usually slender and loosely flowered, sometimes reduced to a mere raceme of a few 1-flowered rays, and at the other extreme crowded and spikelike."

The principal varieties which I have indicated are:

Var. ROBUSTA, a large form 4 to 6 feet high, growing in dense clumps in mountain valleys, with panicle 1 foot to 18 inches long. This variety in parts of Texas and Mexico is known as sleepy grass, from an intoxicating or narcotic effect which it produces upon horses or cattle which feed upon it.

Var. PUBESCENS. A variety, or perhaps a species, of Nevada, Oregon, and Washington, 2 to 3 feet high, with pubescent leaves and sheaths, the awns also strongly pubescent below.

Var. MINOR. Smaller throughout, occurs at higher altitudes, the awns usually shorter.

Var. LETTERMANI Vasey. Slender, small-flowered, and short-awned.

There are many intermediate forms, probably including S. Columbiana *Macoun*.

4. **S. occidentalis** Thurb. Bot. Cal. II. p. 285. Culms slender, 1 to 2 feet high, somewhat scabrous, more or less pubescent at the nodes; radical leaves 2 to 4 inches long, those of the culm shorter, all involute, rigid and rough; sheaths shorter than the internodes; ligule conspicuous, 2 to 3 lines long, lacerate; panicle 3 to 6 inches long, the base often included, contracted; rays mostly erect, the lower in twos or threes and few-flowered, the upper solitary and 1-flowered; lower glume 5 lines long,

3- or indistinctly 5-nerved, somewhat exceeding the 3-nerved upper one; floral glume 3 to 3½ lines long, brownish when ripe, pubescent with appressed hairs, especially below; callus short, acute, the apex with a short, distinct crown of hairs; awn 1½ inches long, twice bent and plumose to the upper geniculation, with rather coarse hairs, less than a line long below and shorter above; palet one-fourth shorter than floral glume; anthers naked.

The above is essentially Prof. Thurber's description, and answers well to a portion of the specimens in the Nat. Herb., under that name; others so named have short inconspicuous ligules, and belong to the next species.

5. S. stricta Vasey. Bull. Torr. Club, x. p. 42. Culms tufted, 1 to 1½ feet high, erect; lower leaves 6 inches long, narrow, with long setaceous points, the upper shorter, the uppermost sheathing the base of the panicle; ligule very short and indistinct; panicle 4 to 8 inches long, strict, erect, the lower branches in twos or threes, 1 to 2 inches long, appressed, flowering to the base; outer glumes narrowly lanceolate, acuminate, 3-nerved, thin, 5 lines long; flowering glume about 3 lines long, including the acute stipe, sparsely pubescent all over; awn 1 to 1½ inches long, twice bent, the lower half strongly pubescent or nearly plumose.—Oregon and Washington.

Var. SPARSIFLORA. Leaves involute-filiform, shorter than in the type, the panicle thinner and fewer-flowered, the awn less pubescent.—California (*Bolander*, No. 5038 and 5020), Oregon (*Cusick*) and Washington (*Suksdorf*).

B. *Panicle more open; branches erect.*

6. S. Stillmani Bolander. (Bot. Cal. II. p. 287.) Culms tufted, stout, 3 to 5 feet high, geniculate below, smooth, except the pubescent nodes; radical leaves 12 to 18 inches long, those of the culm (4 or 5) much shorter, all glaucous, involute, at least at the long-attenuated apex, the lower 3 to 4 lines wide at the base, mostly smooth below, scabrous above and on the margins; ligule minute; sheaths loose, shorter than the internodes, striate, smooth, slightly bearded at the throat; panicle 5 to 10 inches long, narrow and spike-like, interrupted below, nearly white and lustrous, the axis puberulent with an incomplete pilose ring at the nodes; rays crowded and fasciculate, more or less united below, 1- to few-flowered; glumes nearly equal, about 9 lines long, acuminately bristle-pointed, membranaceous-hyaline, the lower 3, the upper more or less 5-nerved at base; floret 5 lines long, with a short, one-sided, white, hairy callus; lower palet herbaceo-chartaceous, distinctly 3-nerved, sparsely pubescent throughout, the divisions of the two-cleft tip nearly a line long; upper palet similar; awn inserted below the tip of the palet, 12 to 15 lines long, tortuous, slightly bent above the middle, scabrous; stamens 3; anthers long, mucronulate.—Southern California.

7. S. coronata Thurb. Bot. Cal. II. p. 287. Culm 4 to 6 feet high, 3 or 4 lines thick at base, where it is clothed with the remains of old sheaths; lower culm leaves about 3 feet long, 4 to 6 lines wide at base, gradually attenuated to a long involute point, the uppermost about 6 inches long, almost filiform and rigid, all slightly scabrous on both surfaces and margins; ligule very short, lacerate-fringed; sheaths somewhat loose, the uppermost much dilated, striate, smooth, except the margins, these mostly ciliate, especially at the throat; panicle 12 to 16 inches long, at first spike-like and included for one-third or one-half its length, at length exserted and loose, but narrow, with erect branches; lower rays in pairs or threes, long and flower-bearing above, the upper in fascicled clusters and flower-bearing to the base; spikelets short-pediceled, pale-greenish becoming purplish; glumes unequal, the 3-nerved lower about 8 lines, and the 5-nerved upper, 6 lines long, both acuminate and somewhat bristle-pointed, slightly scabrous on the nerves; floret, including the brief curved callus and long hairy crown, 5 lines long; lower palet scarcely chartaceous, bifid, with delicate hyaline teeth less than a line long, clothed with silky, shining hairs, those below about a line long, the upper more numerous, forming a dense tufted

corona 2 lines long; awn about an inch long, slender, bent mostly below the middle and minutely scabrous; upper palet about half the length of the lower; stamens 3; anthers naked.—Southern California.

8. **S. speciosa** Trin. & Rupr. (Bot. Cal. II. p. 284.) "Culm 1 to 2 feet high; radical leaves half as long as the culm, the others much shorter, and with the sheaths minutely puberulent; upper sheath inflated, its leaf about 4 inches long, its ligule less than a line long, that of the lower sheaths minute and fringed; panicle 6 to 8 inches long, included below, contracted, its appressed rays mostly in pairs and 6 to 8 flowered; glumes 8 or 9 lines long, nearly equal, long-acuminate and often lacerately 2-toothed at the apex, hyaline, the lower 3- and the upper 5- or indistinctly 7-nerved; floret 5 or 6 lines long, with a short callus; lower palet one-third longer than the upper, silky pubescent throughout, slightly but distinctly 2-toothed; awn 1½ to 2 inches long, geniculate below the middle, plumose from the base nearly to the bend, with conspicuous white silky hairs 3 lines long, smooth above; anthers 3, beardless."—California, Arizona and Nevada.

Var. MINOR. Smaller than the type, sometimes with the foliage yellowish. *S. chrysophylla* Desv.?

9. **S. Parishii** Vasey. Bot. Gaz. VII. p. 32. Culms 1 to 1½ feet high, leafy, especially below; leaves conduplicate or involute, smooth, rigid and divergent; lower ones 6 inches, upper ones about 3 inches long; throat of sheath fringed with a few soft white hairs; ligule very short, upper sheath long, somewhat inflated and inclosing the base of the panicle; panicle about 6 inches long, open and somewhat spreading, except at the included base; lower branches in threes, upper in pairs or single, rather few-flowered at the ends of the branches and branchlets; longest rays about 2 inches; outer glumes linear-lanceolate, acute, 3-nerved, smooth, the lower one 6 to 7 lines long, the upper 5 to 6 lines, nearly twice as long as the flowering glume with the stipe (3 to 4 lines long), densely clothed with silky hairs longer toward the apex, bidentate, the teeth less than a line long; awn 9 lines long, smooth below, scabrous above.—Collected in the San Bernardino Mountains of California by *S. B. Parish*, for whom it was named.

9. **S. Scribneri** Vasey. Bull. Torr. Club, XI. p. 125. Culms 2 to 3 feet high, stout, erect; lower leaves as long as the culm, smooth, flat below, becoming involute at the long acuminate point; upper sheath inclosing the base of the panicle, which is narrow, erect, and 6 to 8 inches long, the branches in twos or threes and appressed; outer glumes unequal, lower one 6 to 7 lines, upper about 5 lines long, both 3-nerved, acuminate; flowering glume 3 to 5 lines long, hairy; hairs longer above, and at the apex forming a white crown a line or more long; awn rather slender, 8 to 9 lines long, not hairy; stipe short, very acute, pubescent; palet less than a line long, obtuse and adherent to the grain.

Differs from *S. viridula* particularly in the unequal glumes, the hairy-crowned flowering glumes, the more slender awn, and the very short palet.—Collected on dry hillsides at Santa Fé, New Mexico.

C. Panicle open, the lower branches spreading.

11. **S. comata** Trin. & Rupr. (Bot. Cal. II. p. 285.) "Culms 1 to 4 feet high, stout, mostly scabrous; leaves involute, roughened, the radical one-fourth to one-third the length of the culm, the leaves of which are much shorter, the uppermost very small or reduced to a mere sheath; ligule conspicuous, acute, 2 to 3 lines long; sheaths loose, the uppermost somewhat inflated, smooth, at length shorter than the internodes; panicle included at base by the upper sheath, open, 8 to 12 inches long; rays ternate or in pairs, distant, few-flowered; glumes about an inch long, nearly equal, 5-nerved, with a long subulate point; floret (including callus of 2 lines) 6 lines long, readily deciduous; lower palet rather sparsely pubescent with coarse hairs, but with no distinct corona; awn 4 to 6 inches long, seldom distinctly geniculate, scabrous, especially above, shining, variously curled and twisted, soon deciduous; upper palet

equaling the lower; stamens 3; anthers mucronulate at apex (but not barbulate as described by Trin. & Rupr.). Stipaceæ 76; Watson, Bot. King Exped., 380; *S. juncea* Nutt. Gen., I, 58, not Linn.; *S. capillata* Hook. Flor. Bor. Amer. II. 237, not Linn. *S. occidentalis* Bolander, Proc. Calif. Acad. IV. 169, in part."—Rocky Mountains to British America.

12. **S. spartea** Trin. (PORCUPINE GRASS). (Gray's Manual, 6th ed., p. 641.) Culms rather stout, 1½ to 3 feet high, simple, erect; sheaths longer than internode, ligule very short, obtuse; radical leaves 1 to 2 feet long, involute, pointed, those of the culm complanate or involute, 6 inches long; panicle contracted, 4 to 6 inches long, lower branches in twos, erect, rather few-flowered; spikelets large, on pedicels as long or shorter; empty glumes 12 to 18 lines long, lanceolate, subulate-pointed; flowering glume 8 to 10 lines long, including the 3 lines long, obconic, sharp-pointed stipe, brown when mature, sparsely pubescent, with a few short hairs at the crown; awn stiff, twisted, twice bent above, 3 to 6 inches long.—Plains and prairies, Missouri, Iowa, Kansas and northward.

13. **S. pennata** Linn. Var. NEO-MEXICANA Thurb. (Coult. Rocky Mt. Fl., p. 408.) Culms tufted, 2 to 3 feet high; radical leaves half to two-thirds as long as the culm, filiform-convolute, smooth, those of the culm short, sheaths striate, equaling or longer than the internodes; panicle about 6 inches long, close, nodding, the branches erect, the lower in twos, with few large spikelets; empty glumes 1½ inches long, equal, with long, setaceous points, 7- to 9-nerved; flowering glume 7 to 8 lines long, including the obconic, brown, sharp-pointed, 3 lines long, stipe; sparsely hairy in lines, contracted below the cup-like apex; awn about 6 inches long, flexuous, twice bent, pubescent or plumose to the apex, with white hairs.—Texas, New Mexico and Arizona.

14. **S. leucotricha** Trin. & Rupr. Gram. Agrost. p. 54. Culms 1 to 2 feet high, nodes downwardly barbed with white hairs, sheaths commonly shorter than the internodes; leaves about 6 inches long, linear-convolute, filiform; panicle 3 to 4 inches long, generally included at base by the upper sheath, becoming exserted, sparsely-flowered; the lower branches in twos, unequal, erect; outer glumes acuminate, subequal, 6 to 7 lines long, 3-nerved, pale-green or colored, awn-pointed; flowering glume 4 to 5 lines long, including the stipe (white-hairy), as also the lower part of the glume, the upper part papillose-scabrous, somewhat contracted below the apex or corona, with a fringe of white hairs; awn 2½ to 3 inches long, twisted and geniculate.—Texas and New Mexico.

This is quite distinct from *S. setigera*.

15. **S. setigera** Presl. (Bot. Cal. II. p. 286.) "Culm 1 to 3 feet high, pubescent at the nodes, with radical leaves about one-third as high; culm leaves flat, 2 or 3 lines wide below, long-attenuated above, rough-pubescent and sometimes ciliate on the margins, the uppermost nearly equaling the panicle; ligule about 1 line long, truncate and split; sheaths two, pilose at throat, the lower shorter than the internode, the upper loose; panicle about 6 (sometimes 12) inches long, mostly included below, loose, flexuous, more or less secund when young, the slender rays in pairs; pedicels shorter than the spikelets; glumes 6 to 9 lines long, long-acuminate, the upper rather shorter, usually purplish, strongly 3-nerved; floret (including a callus of 1 line) 5 lines long, constricted below a distinct corona; lower palet tubercular-roughened, silky-hairy especially on the nerves; upper palet hyaline, scarcely a third as long; awn 2 to 3 inches long, slender, flexuous, more or less distinctly bent above the middle, strongly pubescent below, minutely so above, persistent; anthers bearded at the apex."—California.

16. **S. eminens** Cav. (Bot. Cal. II. p. 286.) "Culms 1 to 3 feet high, slender, pubescent at the nodes; leaves convolute-setaceous, somewhat rigid, slightly scabrous, those of the radical tufts about half as long as the culm; lower culm leaves 6 to 8, the uppermost 2 inches long; ligule very minute; sheaths striate, smooth; panicle 4 to 6 inches long, soon exserted, somewhat secund, the very slender

rays short, in pairs, few-flowered; lower glume about 5 lines long, the upper 4 lines, acuminate, 3-nerved, purplish; floret a little more than half the length of the lower glume; callus a little less than one-half line long; corona short, but distinct; lower palet hairy throughout, the upper about one-third as long and hyaline; awn about 1 inch long, very slender, bent near the middle, minutely and evenly scabrous, readily falling away; stamen 1, small, oval."—California.

Var. ANDERSONII. Culms and leaves more slender, panicle thinner, empty glumes 3 to 4 lines long, 3-nerved, flowering glume 2 lines long, nearly cylindrical, tapering slightly above, sparsely hairy, corona very short; awn 10 to 12 lines long.—Lower California (*Dr. Anderson, Dr. Hasse, Allen, and others*).

17. **S. avenacea** Linn. (BLACK OAT GRASS). (Gray's Manual, 6th ed., p. 641.) Culms slender, 1½ to 3 feet high, about 3 nodes; radical leaves 1 to 1½ feet long, filiform, those of culm short, ligule 1½ lines long, acute; panicle 3 to 5 inches long, narrow, branches mostly single or the lower in twos, 1 to 2 inches long, erect-spreading, few-flowered; empty glumes about 5 lines long, the lower 3-nerved, upper 5-nerved, acute; flowering glume 4 lines long, including the sharp, brown hairy stipe, the body brown, smooth below, punctate, scabrous above, much constricted at apex, the crown with a few short hairs, awn about 2 inches long, bent above, twisted below; palet a little exceeding its glume.—New England to Florida, west to Wisconsin and Texas.

18. **S. flexuosa** Vasey. Torr. Bull. XV. p. 49. Culms slender, 2 to 2½ feet high; radical leaves 1 to 1½ feet long, narrow; panicle 5 to 8 inches long, slender and flexuous; branches distant, the lower in fives, upper in twos, capillary, 2 to 2½ inches long, rather few-flowered, naked below; empty glumes unequal, linear, acute, the lower 5 lines long, faintly 3-nerved below, the upper about 4 lines long, distinctly 3-nerved; flowering glume 3 to 3½ lines long, including the acute stipe, tapering above, sparsely pubescent; awn slender, sparsely pubescent below, about 2 inches long.

Distinguished from *S. avenacea* by its long panicle, longer and more capillary branches, and small spikelets.—Texas, New Mexico and Arizona.

19. **S. Bloomeri** Boland. (*S. Sibirica* Thurb., non Lam., Bot. Cal. II. p. 287.) "Culms 1½ to 3 feet high, clothed at the base by the remains of old sheaths; leaves very narrow and involute, smooth or slightly roughened, the radical about half equaling the culm; ligule short; sheaths shorter than the internodes, the upper somewhat inflated, its blade about half as long as the panicle, pale-green throughout; panicle 6 to 12 inches long, erect, narrow; rays distant, the lower in threes or fives, the upper in pairs, branching and few-flowered; spikelets 4 lines long; glumes nearly equal, acuminate in a slender point, 3-nerved, minutely scabrous and one-fourth longer than the fusiform short-callused floret; lower palet about 2½ lines long, minutely 2-toothed at the apex, brownish at maturity, with long, rather coarse hairs; upper palet nearly equal; awn 6 to 9 lines long, flexuously geniculate near the middle, below which it is strongly pubescent (almost plumose), scabrous above; anthers conspicuously bearded."—California (*Bolander*).

20. **S. caduca** Scribn. (*Oryzopsis caduca* Beal.) Culms tufted, about 2 feet high; leaves narrow, becoming involute, the lower 10 to 12 inches long, the uppermost one setaceous, equaling or exceeding the panicle; panicle 6 to 7 inches long, loose, the lower rays in pairs, unequal, erect-spreading, the longer 2 to 3 inches long, subdivided and flowering above the middle; spikelets mostly on pedicels as long as themselves; empty glumes 3½ to 4 lines long, ovate-lanceolate, acuminate, 3-nerved; floral glume oblong tapering at each end, 2½ lines long, covered with long, white hairs, not constricted at the neck, stipe short, acute; palet about half as long as its glume, obtuse; awn 9 to 10 lines long, smooth, nearly straight, very deciduous.—Montana (*Scribner*).

21. **S. Pringlei** Scribn. Culms stout, 3 feet high; radical leaves narrow, 1½ to 2 feet long, scabrous; cauline ones shorter, rigid, ligule short; panicle 8 to 10 inches long, narrow, the branches long and slender, in twos to fives, naked below, few-flowered above; empty glumes 5 lines long, abruptly acuminate, 5- to 7-nerved;

flowering glumes oblong, obconic, 4 lines long, sparsely pubescent, constricted at the apex, the crown short-hairy, awn about 1 inch long, smooth, bent above.—Mexico (*Pringle*) and Arizona (*Pringle, Lemmon, Tracy*). Spikelets larger than in *S. Bloomeri*.

Var. LEMMONI. Flowering glume brown, hairy, rather thicker than in the type, less tapering at the apex, and with a more decided constriction of the neck.—Mountains of Plumas County, Cal. (*J. G. Lemmon*).

22. **S. Richardsoni** Link. (Gray's Manual, 6th ed., p. 641.) Culm slender above, 1½ to 2 feet high, radical leaves slender, one-half to two-thirds as long as the culm; panicle loose and spreading, the branches in twos, the lower one 3 to 5 inches long, slender, naked below, few-flowered near the apex; empty glumes unequal, the lower about 5 lines long, the upper one-fourth shorter, both 3-nerved; flowering glumes 3 lines long including the short stipe, sparsely hairy, narrowed above, brown; awn 10 to 12 lines long.—British Columbia, Montana to the Yellowstone Park.

This is a large form which Prof. Macoun calls var. *major*, and is larger, and perhaps specifically distinct from the ferm which is found on Lake Superior and eastward.

23. **S. Mongolica** Turcz. Act. Petrop. 1836, p. 42. Annual, culm slender, simple, 10 to 15 lines high; radical leaves filiform, erect, the lower 3 to 5 lines long, the cauline ones about 1 inch long; panicle 3 to 4 inches long, open, spreading, the lower branches in twos, filiform, 1½ inches long, sparsely-flowered mostly above the middle, purplish; empty glumes equal, 2½ lines long, obtuse, smooth; flowering glume 2 lines long, including the very short, obtuse callus, sparsely-hairy below, and at apex; awn plumose, twisted below, bent above, 6 to 8 lines long.—Mountains of Colorado.

ORYZOPSIS Michx.

This genus differs from Stipa in having a usually broader floral glume, the callus of which is shorter and blunt, and in having a very short and deciduous awn, which is sometimes slightly eccentric, or to one side.

1. **O. asperifolia** Michx. (Gray's Manual, 6th ed., p. 642.) Culms 12 to 18 inches high, overtopped by the long and rigid persistent leaf from the base; the upper sheaths with very short or rudimentary blade; panicle linear, 2 to 3 inches long, nearly simple, few-flowered; empty glumes 3 lines or more in length, the flowering glume as long, sparsely hairy, with a blunt hairy callus, awn 5 or 6 lines long; palet about as long as its glume and with 2 narrow lodicules nearly as long as the palet; styles united below, slender.—New England to Minnesota and northward to Alaska; also Colorado to Texas.

2. **O. Canadensis** Torr. (Gray's Manual, 6th ed., p. 642.) Culms slender, 6 to 15 inches high; leaves becoming involute, filiform, 6 to 10 inches long, or much reduced; panicle narrow, 1 to 2 inches long; the branches usually in pairs, compound, erect; spikelets less than 2 lines long; empty glumes broad, 1-nerved; flowering glume, rather shorter, very pubescent, whitish; awn short (one-third to one-half line) and very deciduous, or wanting.—Maine to Colorado and northward.

3. **O. exigua** Thurb. U. S. Exp. Wilkes, p. 481. Culms slender, tufted, 6 to 15 inches high; leaves 4 to 5 inches, the upper 1 to 2 inches long, rigid, ligule conspicuous, 1 line long; panicle 1 to 2½ inches long, linear; the branches mostly simple, the lower sometimes in twos, erect and appressed; empty glumes 2 to 2½ lines long, the lower 1-nerved, the upper 3-nerved at base, obtuse and mucronate, pubescent, a little longer than the flowering glume, the latter sparsely pubescent; awn twisted below, about 2 lines long; palet equaling its glume; stamens 3, styles 3; lodicules 2, as long as the ovary.—Oregon and Washington.

This species is closely allied to *O. Canadensis*, from which it differs in its more simple panicle, less pubescent flowering glume, and longer and less deciduous awns.

4. **O. Webberi** Vasey. (Bot. Cal. II. p. 283). Culms densely tufted, 4 to 7 inches high; leaves convolute, rigid, pungent, scabrous, the radical 3 to 4 inches long, the

cauline 1 or 2 inches; lower sheaths crowded and dilated; panicle 1 to 4 inches long, narrow, the lower branches short and erect, or fascicled and long; empty glumes, 4 lines long, acuminate; flowering glumes, about 3 lines long, with a short callus, 5-nerved, apex minutely 2-lobed, covered with copious silky white hairs, a line long, awn 2 lines long, very deciduous.—Sierra Valley (*Lemmon*) and Reno, Nevada, (*S. M. Tracy.*)

5. **O. melanocarpa** Muhl. (Gray's Manual, 6th ed., p. 642.) Culms erect, 2 to 3 feet high, leafy; leaves broad and flat, taper-pointed, 6 to 8 inches long; panicle 6 to 9 inches long, lower branches in pairs, 2 inches long, erect, finally spreading, naked below the middle, few-flowered above; empty glumes 4 to 5 lines long, acute, about 7-nerved; flowering glume slightly shorter, acuminate, coriaceous, sparsely pubescent; awn about an inch long; styles short and distinct.—New England to Missouri and Minnesota.

6. **O. micrantha** Thurb. (Coult. Rocky Mt. Fl., p. 408) (*Urachne micrantha* Trin. & Rupr.) Culms tufted, slender, 2 feet high; leaves linear, setaceous, involute-pointed, scabrous margined, the radical 10 to 12 inches long; panicle 4 to 6 inches long, the lower branches in pairs, 1 to 2 inches long, rather distant, becoming spreading, flowering beyond the middle; spikelets 1½ lines long; empty glumes thin, nerved, acute; flowering glume one line long, smooth; awn 3 lines long.—New Mexico, Colorado and northward.

7. **O. fimbriata** Hemsl. (*Stipa fimbriata* H. B. K.) (Kunth Gram. I. p. 263.) Culms tufted, slender, 2 to 2½ feet high; leaves filiform, setaceous, the radical a foot long or more, the cauline shorter; panicle 3 to 5 inches long, the lower branches in twos or threes, capillary, few-flowered toward the extremity; spikelets or empty glumes about 3 lines long, acute; flowering glume 2 lines long, very pubescent; awn 6 to 8 lines long, smooth.—Western Texas, New Mexico, Arizona and Mexico.

8. **O. membranacea** Vasey. Grasses of the Southwest, Pt. 2, p. 10. (*Stipa membranacea* Pursh.; *Eriocoma cuspidata* Nutt.; *Stipa hymenoides* R. & S.; *Milium cuspidatum* Spreng; *Urachne lanata* Trin.; *Fendlerai rhynchelytroides* Steud.) Culms tufted, 1 to 2 feet high, mostly simple, sometimes geniculate, rather slender; leaves setaceously-convolute, rigid, scabrous, the lower often equaling the culm, scabrous, pungent; upper sheaths dilated; the blade overtopping the panicle or reduced to a filiform point, ligule a line long; panicle 4 to 6 inches long, widely spreading when mature, the capillary, flexuous branches mostly in pairs, the lower dichotomously branched, the branches 1-flowered; spikelets 3 or 4 lines long, on long filiform pedicels; empty glumes ventricose below, attenuate above, pubescent, 3- to 5-nerved below; flowering glume broadly oval, about 2 lines long, densely long hairy, in age losing the hairs and becoming black, hard and shiny, the apex bifid; awn deciduous 2 lines long; palet narrow, entire, about equal to the glume.—British America to California and Mexico.

Said to be a valuable and nutritious grass. Grows in gravelly or sandy ground.

The difference between *Stipa* and *Oryzopsis* appears arbitrary, and botanists disagree as to the species included in each.

MILIUM Linn.

Spikelets 1-flowered, consisting of 2 equal, membranaceous, convex, awnless persistent glumes, with a coriaceous awnless flowering glume, and narrow palet, resembling a *Panicum*, but not jointed below the flowering glumes; panicle diffusely spreading. Grain inclosed in its glume and palet, all deciduous together.

1. **M. effusum** Linn. (WILD MILLET-GRASS.) (Gray's Manual, 6th ed., p. 642.) Perennial, culms smooth, 3 to 6 feet high; leaves broad, flat, thin, 6 to 10 inches long; panicle, 6 to 9 inches long, spreading, the branches 2 to 5 together, naked below; empty glumes about 1½ lines long, equal, 3-nerved; flowering glume about equal, oblong-ovoid, the edges overlapping the palet, about the same length.—Northern United States and Canada.

CINNA Linn.

Spikelets 1-flowered, much flattened, in an open, spreading panicle; outer glumes lanceolate, acute, strongly keeled, hispid on the keel, the upper somewhat longer than the lower; flowering glume manifestly stalked above the outer glumes, about the same length, 3-nerved, short-awned on the back near the apex; palet nearly as long as its glume, only 1-nerved ("probably by the consolidation of 2," *Bentham*); Stamen 1. A sterile pedicel sometimes present.

1. **Cinna arundinacea** Linn. (Gray's Manual, 6th ed., p. 649.) (*Muhlenbergia pendula* Bong.; *Blyttia suaveolens* Fries.; *Cinna latifolia* Griseb.) Culms 3 to 6 feet high, stout; leaves 4 to 6 lines wide, 1 foot long; ligule elongated, conspicuous; panicle 6 to 12 inches long, rather dense, spreading in flower, afterward close, lower branches 4 or 5 together, about 2 inches long; spikelets 2½ to 3 lines long, flattened; empty glumes linear-lanceolate, roughish, acute, mostly 3-nerved, the upper nearly as long as the spikelet, the lower rather shorter; flowering glumes oblong-lanceolate, 3-nerved, usually with a minute awn near the apex; palet 1-nerved.—Moist woods and swamps, Canada to Texas, and northern Rocky Mountains to Oregon and Washington.

2. **C. pendula** Trin. (Gray's Manual, 6th ed., p. 649.) Usually more slender than the preceding species, with a looser, drooping panicle, more capillary branches, and smaller spikelets (about 2 lines). Same range as the preceding.

Var. MUTICA. Spikelets less than 2 lines long, flowering glumes awnless—Oregon.

Var. BOLANDERI. (*Cinna Bolanderi* Scribn). Tall and stout; leaves broad; panicle lax, thin; spikelets 2 to 2½ lines long; flowering glumes shorter than the outer ones.—California (*Dr. Bolander*).

POLYPOGON Desf.

Panicle dense and spike-like or somewhat branched or lobed; spikelets 1-flowered, very small, rarely exceeding a line in length. Glumes nearly equal, compressed, 1-nerved, and bearing a long awn at or below the apex; floret much shorter than the glumes, without manifest callus, and naked at base; lower palet hyaline, broad, 1-nerved (or obscurely 5-nerved), truncate, toothed, awned at the apex; scales 2, falcate, entire, as long as the ovary. Stamens 3. Anthers small. Styles short, with long feathery stigmas.

1. **Polypogon Monspeliensis** Desf. (ANNUAL BEARD-GRASS.) (Bot. Cal. II. p. 270.) "Culms 5 inches to 2½ feet high, procumbent and geniculate at base, rarely erect, often branching from the lower nodes; leaves broad, flat, somewhat scabrous; sheaths smooth; ligule 2 or 3 lines long, obtuse; panicle 2 to 6 inches long, cylindrical or somewhat interrupted, yellowish, dense, and soft; spikelets about a line long; glumes notched at the apex and emitting an awn two or three times their length; lower palet with an awn equaling or slightly exceeding the glumes."—California and Arizona to Texas.

2. **P. littoralis** Smith. (Bot. Cal. II. p. 270.) "Culms from a perennial root, forming large tufts, 1 to 2 feet long or more; leaves rather narrow, scabrous on both sides; ligule 1 to 3 lines long, acute; panicle narrow, much lobed its whole length, and sometimes completely interrupted below, usually purplish; glumes more or less pubescent and distinctly aculeate on the keel, tapering into an awn of about their own length; awn of lower palet slightly exserted beyond the glumes."—Same range as the preceding.

3. **P. maritimus** Willd. (Chapm. Fl. S. States, p. 552.) Culms simple, 6 to 8 inches high; glumes pubescent, hispid on the keel, one-third as long as the slender awns; flowering glumes 4-toothed, unawned.—Seashore of North and South Carolina (*Dr. Chapman*). Introduced.

Agrostis microphylla var. MAJOR of California, seems properly to belong in this genus, and is perhaps **P. elongatus** H. B. K.

THURBERIA Benth.

Panicle rather long and loose; spikelets narrow, 1-flowered, and with an awn-like pedicel; outer glumes equal and coriaceous, the flowing glume nearly as long, chartaceous, compressed, the apex obliquely truncate and terminating in a long twisted awn; palet somewhat shorter and narrower, membranaceous. Stamens 3. Styles distinct.

1. **Thurberia Arkansana** Benth. (Benth. in Gen. Plant. III. p. 1118.) (*Streptachne* Torr.; *Greenia Arkansana* Nutt; *Limnas Arkansana* Trin.; *Limnas pilosa* Trin.) Apparently annual; culms 1 to 2 feet high; leaves linear-lanceolate, 2 to 4 inches long, somewhat scabrous, and the sheaths more or less pubescent; panicle narrow, loose, 3 to 5 inches long, branches scattered or semiverticillate, the lower 1 to 2 inches long, loosely flowering to the base; spikelets 1½ lines long, on rather short pedicels; empty glumes equal, linear-lanceolate, coriaceous, hispid, abruptly acute or acuminate; flowering glumes nearly as long, chartaceous, smooth, faintly 3-nerved, shortly 2-toothed at apex, and terminating with a twisted awn 4 or 5 lines long; palet narrow, shorter than the flowering glume; a minute rudiment or pedicel at the base of the flowering glume.—Florida to Texas, Arkansas and Indian Territory.

EPICAMPES Presl.

Spikelets much as in Sporobolus, but contracted in a long, narrow, and dense panicle; outer glumes somewhat unequal, membranaceous, convex on the back, scarcely keeled, obtuse, 3-nerved. Flowering glume mostly equaling the outer ones, sometimes 3- to 5-nerved, entire or sometimes awned from the apex; palet hyaline, about equaling the flowering glume, 2-nerved or 2-keeled.

1. **Epicampes rigens** Benth. (Bot. Cal. II. p. 267, as *Cinna macroura.*) "Culms 3 or 4 feet high, erect and rigid, smooth or slightly pubescent below the nodes, clothed below with broken and withered sheaths; leaves narrow, convolute, and attenuate at apex, rough pubescent, the lower 3 to 4 and the uppermost 1 to 2 inches long, all very rigid; ligule 2 to 3 lines long; sheaths much longer than the internodes, loose, rough; panicle 1 to 2 feet long, erect, very narrow, dense, and tapering above, loose and interrupted below, the base sometimes included; rays fascicled, very unequal, the longer (1 to 4 inches long) flower-bearing above, the shorter for their whole length; all, with the common axis, more or less roughened; spikelets 1½ to 2 lines long, scarcely compressed, minutely scabrous-pubescent, and on rough pedicels about their own length; glumes acute at apex or blunt with a minute point, the lower somewhat longer and indistinctly 3-nerved; floret usually somewhat exceeding the glumes, with a brief and minutely hairy callus; palets very delicate in texture, the lower minutely pubescent, more or less acute, 3-nerved, broad, and involving the very thin distinctly 2-nerved upper one, which is about the same length; stamens 3 with linear anthers."—Texas to California.

1. **Epicampes ligulata** Scribn. Culms 2½ to 3 feet high, erect, smooth, 5 nodes; lower leaves 1 to 1½ feet long, 2 to 3 lines wide, rigid; ligule conspicuous, 6 to 9 lines long; panicle 8 to 12 inches long, narrow (8 to 12 lines wide), loose, branches erect, scattered, approximate, narrow, flowering to the base; spikelets little more than 1 line long;

empty glumes about equaling the flowering glume, barely pointed; flowering glume oblong, obtuse, or apiculate, 3-nerved, smooth; palet equaling the glume.—Texas to Arizona and Mexico.

ARCTAGROSTIS Griseb.

Spikelets one-flowered, in a contracted, mostly spike-like panicle; pedicels of the spikelets rather clavate and usually articulated below the glumes; outer glumes nearly equal and long-awned from the apex; flowering glume smaller, thinner, generally hyaline, and generally prolonged at the apex into a slender awn; palet thin, sometimes considerably shorter than its glume.

1. **Arctagrostis latifolia** Griseb. Flora Rossica IV. p. 434. (*Colpodium latifolium* R. Br.) Culms strict, smooth, 6 to 12 inches high; leaves broadly linear; ligule short-oblong, truncate, lacerate; panicle lanceolate-linear, contracted; spikelets large; empty glumes ovate-oblong, acutish, the upper one-third longer than the lower; flowering glumes herbaceo-membranaceous, sparsely scabrous-pubescent, about 2 lines long, ¼ to ⅓ longer than the upper glume, obscurely 3-nerved; palet nearly equal to its glume.—Point Arrow, Fort Conger and Arctic coast.

Var. ARUNDINACEA Griseb. in Flora Rossica (var. *Alaskensis* Vasey; *Sporobolus arundinaceus* Vasey; *Vilfa arundinacea* Trin. Icones Gramin. I. pl. 55). Culms taller (2 to 3 feet), panicle laxer and larger, floral glume obscurely 5-nerved.—Alaska.

SPOROBOLUS R. Br.

Spikelets 1, or rarely 2-flowered, in a contracted or open panicle. Outer glumes unequal, the lower one shorter, often acute, unawned, 1- to 3-nerved, membranaceous; flowering glume mostly longer, unawned; palet about equaling the flowering glume, and of the same texture, prominently 2-nerved. Seed mostly loose in a hyaline or rarely coriaceous pericarp.

§ 1. *Panicle contracted, spike-like, or becoming somewhat spreading. Culms erect or spreading, scarcely branched.*

1. **Sporobolus Indicus** R. Br. (Gray's Manual, 6th ed., p. 646.) Culms tufted, erect, 1 to 3 feet high, smooth, lower leaves half as long as the culm, terminating in a long, fine point; the upper similar; ligule obsolete; panicle narrow, 4 to 12 inches long, tapering at the point, often interrupted at the base; branches one-half to 1½ inches long, erect, flowering to the base; spikelets sessile, crowded on the branches, about 1 line long; empty glumes obtuse, the lower one-half, the upper two-thirds as long as the floral glume; floral glume acutish, 1-nerved; palet about as long as its glume, faintly 2-nerved.—Introduced, but widely dispersed.

2. **S. Virginicus** Kth. (Gray's Manual, 6th ed., p. 646.) (*Vilfa Virginica* Beauv.; *Podosæmum Virginicum* Link.) Culms much branched at base, from a running rootstock, erect or decumbent 6 to 12 inches high; leaves short and convolute, distichous, rigid, often spreading and recurved; panicle 2 to 4 inches long, densely flowered, or sometimes lax; spikelets about 1½ lines long, the empty glumes nearly erect, perennial.—Seacoast, Virginia to Florida and Texas.

3. **S. asper** Kth. (Gray's Manual, 6th ed., p. 645). (*Vilfa Hookeri* Trin.; *Agrostis longifolia* Torr.) Culms tufted, 2 to 3 feet high, rather stout; lower leaves 1 foot long, tapering to an involute point, the culm leaves shorter than the internodes, the upper one inflated, partly or wholly inclosing the 4 to 6 inch long panicle; spikelet 2 to 2½ lines long, empty glumes broad, obtuse, the lower one-half and the upper two-thirds as long as the spikelet, flowering glume and palet nearly equal, smooth or pubescent below, obtusish at apex.—Maine to Texas.

Var. DRUMMONDII (*Vilfa Drummondii* Trin.) Culms stout, 2 to 3 feet high, smooth, firm, sometimes with a few lateral branches, lower leaves flat, 6 to 10 inches long, the upper becoming involute and setaceously pointed, panicle exserted or looser than in the preceding, 5 to 8 inches long; spikelets about 3 lines long; empty glumes nearly equal, obtuse, about one-half as long as the spikelet; flowering glume attenuated above and one-fourth longer than the palet.—New York to Texas.

4. **S. pilosus** Vasey. Bot. Gaz. XVI. p. 26. Perennial, from thick roots; whole plant pale-green; culms cespitose, rigid, erect, about 1½ feet high, leafy, particularly at the base, mostly simple; sheaths smooth, the uppermost sheathing the base of the panicle, the lower crowded and flattened; ligule inconspicuous; the throat, margin, and both sides of the lower blades pilose, the upper ones involute and attenuated to a long point, shorter than the culm; panicle terminal, spike-like, 2 to 3 inches long, close, the lower part included in the sheath; spikelets 2½ lines long, smooth, the lower empty glume one-fourth shorter than the upper, which equals the flowering glume and palet, all obtuse.—Kansas (*B. B. Smythe*).

Resembles *S. aspera*, which has the leaves longer than the culm, both empty glumes shorter than the flower, and the leaves smooth or not pilose.

5. **S. minor** Vasey. (Gray's Manual, 6th ed., p. 646.) "Culms tufted, perennial very slender, erect or ascending, 10 to 18 inches high, leaves short and narrow; panicle at first sheathed, becoming exserted, 1 to 3 inches long; glumes and palet nearly equal, acute or somewhat acuminate."—Virginia, Illinois, Missouri, South Carolina to Texas.

6. **S. vaginæflorus** Vasey. (Gray's Manual, 6th ed., p. 645.) (*Vilfa*, Torr.) Annual; culms slender, 6 to 12 inches high, ascending or erect; leaves involute, awl-shaped, 1 to 4 inches long; panicles lateral and terminal, concealed in the sheaths; spikelets little more than a line long, glumes and petals nearly equal, acute; grain more than half as long as the palet.—Maine to Texas.

7. **S. cuspidatus** Torr. (Gray's Manual, 6th ed., p. 646.) (*Vilfa cuspidata* Torr.) Culms tufted, strongly rooted, erect, slender and wiry, 12 to 15 inches high; leaves 1 to 4 inches long, very narrow, linear, the branches single, the lower ones 1 inch long, appressed; spikelets 1 to 1½ lines long; the empty glumes acuminate and little shorter than the cuspidate flowering glume.—Maine to Minnesota and in the Rocky Mountain region.

8. **S. gracillimus** Thurb. (*Vilfa gracillima* Thurb.) (Bot. Cal. II. p. 268.) "Culms annual, capillary, smooth, much branched at base, forming small, dense tufts, 3 to 12, but usually about 6 inches high; the leafy portion about 2 inches high; leaves 6 to 9 lines long and less than a line broad, flat, involute at apex, very minutely scabrous on the upper side and margins; ligule about 1 line long, obtuse and lacerate, decurrent; sheaths equaling the internodes, loose, striate, smooth with hyaline margins; panicle long-exserted, narrowly linear, few-flowered, interrupted below; rays in pairs or threes, erect, appressed, 1- to 3-flowered; spikelets about a line long on shorter pedicels; glumes subequal, or the upper larger, membranaceous, colorless, very obtuse, distinctly 1-nerved, mucro or erose-toothed at apex, about half as long as the oblong-lanceolate floret, which has a small callus; petals about equal, blackish, the lower 3-nerved, with a few very minute hairs on the nerves below, mucronate or tipped with a small seta.—In the Sierra Nevada, in wet soil at 11,000 feet altitude, Brewer; Yosemite Valley (*Bolander*); Santa Barbara (*Mrs. Cooper*) and Oregon (*E. Hall*)."

The habit and annual root abundantly distinguish it from any of the forms of *S. depauperatus*.

9. **S. Wolfii** Vasey. Bull. Torr. Club, X. p. 52. (*Vilfa minima* Vasey.) A dwarf annual grass, 1 to 2 inches high, the culms capillary, with a simple, terminal, few-flowered panicle, and one or two similar ones from the axil of the leaves; leaves short, strongly nerved; sheaths inflated, striate; spikelets one-half line long; empty glumes scarcely half as long as the flower; floral glume ovate; palet equaling the glume.—On the shores of Twin Lakes, Colorado (*J. Wolf* and *C. W. Derry*).

§ 2. *Panicle contracted, culms much branched, decumbent and often rooting below.*

10. **S. depauperatus** Vasey (Gray's Manual, 6th ed., p. 646.) (*Vilfa depauperata* Torr.; *Vilfa utilis* Torr.) Culms perennial, tufted, slender, 3 inches to 2 feet long, decumbent and geniculate, many jointed, often much branched leaves commonly 1 to 3 inches long, often involute, ligule conspicuous, acutish; sheaths rather shorter than the internodes; panicle ½ to 3 inches long, very narrow, branches solitary, appressed, the lower sometimes ½ to 1 inch long, flowering to the base; spikelets about 1 line long, on short pedicels; empty glumes nearly equal, ovate, obtuse, one-third to one-half shorter than the flowering glume, the later obscurely 3-nerved, smooth, often blackish, and pointed with a minute mucro; palet about equal to its glume.—Throughout the Rocky Mountain region from Mexico to Montana and British Columbia.

A very variable species, with several distinct forms, one of which with tangled matted culms, used by the Mexicans for stuffing pack saddles, was called by Dr. Torrey *Vilfa utilis.*

11. **S. repens.** Presl. Rel. Hænkeanæ I. p. 241. Culm decumbent from creeping rhizomas 6 to 12 inches long, much branched, nodes many, often geniculate, lateral branches flower-bearing; leaves 1 to 1½ inches long, very narrow; ligule rather long, panicle narrow, the terminal 1 to 1½ inches long, the lateral shorter, few-flowered; spikelets grayish, 1½ lines long; empty glumes nearly equal, one-half as long as spikelet, acutish; flowering glume cuspidate, palet nearly as long, acute.—Texas to Arizona. Much like *S. depauperatus*, of which it is perhaps a form.

12. **S. Sacatilla** Griseb. (Gram. Mexicanum Fourn. p. 101.) Differs from the preceding in the longer culms, more involute and recurved leaves, with shorter ligules, panicles rather more exserted, spikelets shorter (about 1 line long), glumes shorter (hardly ½ line long), flowering glume shorter and acute.—Texas (*Nealley* and No. 746 *Wright*).

§ 3. *Panicle mostly open and spreading; culms erect.*

13. **S. interruptus** Vasey. Bull. Torr. Club, XV. p. 8. Culms 1½ to 2 feet high, rather stout, with few leaves, erect, from a strong creeping rhizoma; leaves mostly at the base, flat, rather rigid, 3 to 6 inches long, 1 to 2 lines wide, the lower sheaths and leaves more or less soft—hairy, ligule almost obselete, upper sheaths very long, smooth; panicle 4 to 6 inches long, narrow and close, with the branches short and interrupted, or panicle loose, with branches alternate, the lower 2 inches long, distant, and the lower third naked; spikelets large (2½ lines long), the pedicels mostly short; empty glumes unequal, lanceolate, acute, the lower one-third shorter, the upper 3-nerved and equaling the spikelet; flowering glume thicker in texture, 1-nerved, acute, smooth; palet nearly equal, 2-nerved; stamens 3, very long.—Arizona.

14. **S. Nealleyi** Vasey. Bot. Gaz. XVI. p. 48. Small; culms from strong rhizoma, erect, slender, about 6 inches high, naked above; leaves few, about 1 inch long, rigid, divaricate, involute, pungently pointed; ligule villous; panicle 1 to 2 inches long, of few (6 or more) short, erect-spreading, few-flowered branches; spikelets less than 1 line long, the lower one-half as long as the second, which equals the palet.—Texas (*G. C. Nealley*).

15. **S. argutus** Kth. Enum. Plant. I. p. 215. (*S. Arkansana* Nutt.; *S. Sabeanus* Buck.) Culms tufted, 6 to 12 inches high, leafy below, leaves 2 to 6 inches long, sheaths ciliate above and at the throat, blade flat, tapering to a fine point, upper sheath long, reaching to or at first inclosing the panicle, 1½ to 4 inches long, narrow at first or becoming pyramidal, spreading, the lower branches in fives, 1 inch long, linear, naked near the base; spikelets less than 1 line long; the longer empty glume one-fourth to one-third as long, the upper as long as the spikelet, acutish.—Mexico to Texas and Colorado.

16. **S. Domingensis** Kth. (Chapm. Fl. S. States Suppl., p. 661.) Culms erect, 10 to 20 inches high, compressed at base; leaves linear-acuminate, flat or convolute rigid;

sheaths conduplicate, compressed, ciliate above and at the ligule; panicle erect-spreading, at length contracted; empty glumes acuminate, the upper equaling the 1-line long spikelet, the lower half as long; flowering glume acute.—Florida (*A. H. Curtiss, Dr. Chapman*).

17. **S. Wrightii** Munro in MS. Culms stout, erect, 3 to 4 feet high, from a stout creeping rhizoma, leafy; sheaths long, smooth; ligule nearly obsolete or sparsely hairy; lower blades 1 foot or more long, narrow, smooth without, scabrous within, tapering into a long filiform point; panicle lanceolate, 12 to 15 inches long, open, the branches very numerous, racemose, narrow, scattered on the smooth axis, 2 to 4 inches long, approximate, erect-spreading at an angle of about 45 degrees, flower-bearing nearly to the base; spikelets nearly a line long, on very short pedicels; empty glumes unequal, the lower ½ and the upper two-thirds as long as the flowering glume, thin; flowering glume obtusish, smooth, little thicker than the empty glumes.—New Mexico, Texas and Arizona.

18. **S. airoides** Torr. (Bot. Cal., II. p. 269.) (*Agrostis airoides* Torr.; *Vilfa airoides* Steud.) Perennial; culms tufted, often stout, from strong-rooting rhizomas, 1 to 3 feet high; leaves rather rigid, strongly revolute and attenuate; panicle broadly pyramidal, soon exserted, 6 to 12 inches long, open and diffuse; rays solitary or in pairs, slender, spreading, rather distantly subbranched, naked below; spikelets a line long, on slender pedicels; empty glumes obtusish, somewhat unequal, the lower one-third to one-half as long as the glume, the upper a little shorter than the flowering glume.—In the Rocky Mountain region; Great Plains; Texas to Montana; California to Oregon.

19. **S. cryptandrus** Gray. (Gray's Manual, 6th ed., p. 646.) Perennial strongly rooted; culms erect or decumbent below, 2 or 3 feet high, sometimes with a few lateral branches, upper nodes distant; leaves flat, 3 to 6 inches long, commonly partially inclosed in the upper sheath, and sometimes permanently and wholly inclosed, the lower branches 2 inches long, flowering nearly to the base; spikelets nearly 1 line long, nearly sessile; empty glumes lanceolate, acute, the lower ½ as long and the upper as long as the spikelet.—New England, westward and southward to New Mexico.

Var. STRICTUS Scribn. Panicle 6 to 12 inches long, the branches permanently strict.—Western Plains.

Var. ROBUSTUS Vasey. Culms remarkably robust, erect, 3 feet high; leaves wider and longer, rigid; panicle partially expanding, 10 to 12 inches long, dense, the branches closely approximate.—Texas (*Nealley*).

Var. FLEXUOSUS Thurb. Panicle 6 to 15 inches long, expanded, and becoming reflexed, longer and more slender, the lower ones sometimes 6 inches long; spikelets rather shorter and more acute, and on pedicels equal to or longer than the spikelets.—Dry Western plains, Colorado, New Mexico, Arizona to Texas.

20. **S. heterolepis**. (Gray's Manual, 6th ed., p. 646.) Culms erect, 2 to 3 feet high, slender, naked above; leaves involute, thread form, the lowest nearly as long as the culm, panicle 4 to 6 or even 10 inches long, open, loose, the branches alternate or several together, at first erect, becoming widely spreading, naked below; spikelets 2½ lines long; empty glumes very unequal, the lower narrow or setaceous, about half as long as the upper, the latter taper-pointed and longer than the floral glume.—Connecticut and New York to Illinois and Wisconsin, Minnesota, and all the prairie region, Texas to British America.

21. **S. tricholepis** Torr. (*Vilfa tricholepis* Torr.) (U. S. Geol. Surv., Wheeler, VI. p. 282.) Perennial, tufted, culms erect, simple; leaves mostly radical short (3 to 6 inches), erect or curved, rigid, involute; the lower sheaths inflated, ligule short, auriculate; panicle oblong, open, 4 to 6 inches long, the branches more or less spreading, scattered, the lower 1 to 2 inches long, loosely flowered; the spikelets on slender pedicels, 1¼ to 1½ lines long; empty glumes thickish, oblong, obtuse or obtusish, nearly equal, a little shorter than the spikelet; flowering glume and palet nearly

equal, both woolly-pubescent on the nerves and margins.—From Texas westward and southward into Mexico.

This species is peculiar in its thickish, persistent glumes and very pubescent flowers.

22. **S. Jonesii** Vasey. Bot. Gaz. VI. p. 296. Culms densely tufted, erect, 1 to 1½ feet high, wiry; radical leaves numerous, short, rigid, and involute, except the lowest; culm with 1 or 2 leaves below, the blade about 1 inch long, setaceous, sheath four times as long, scabrous; panicle erect, thin, 1½ to 3 inches long, rays solitary, appressed, the lower 1 to 1½ inches long, subdivided from the lower third; spikelets mostly very short pediceled, about 1½ lines long; glumes about one-third as long as the flower, broad, obtuse or truncate, and the apex erosely toothed, thin, and purplish; flower with a distinct pedicel or callus; the flowering glume and palet much alike in texture, firmly membraneous, 1-nerved, finely scabrous and pubescent below, 1 to 1½ lines long; the palet narrower and but little shorter, after flowering becoming more elongated, cylindrical, and pointed.—Soda Springs, Cal. (*M. E. Jones*).

23. **S. junceus** Kth. (Gray's Manual, 6th ed., p. 646.) Culms cæspitose, 1½ to 2 feet high, simple, smooth, naked above; leaves slender, involute, the lower elongated, narrow; panicle narrow; lanceolate or almost linear, open, the branches in threes or fives below, 1 inch or less long, few-flowered; spikelets 1½ lines long, purplish, empty glumes lance-ovate, acute or acutish, the lower, half to two-thirds as long as the upper, the latter as long as the flowering glume.—Rare in Texas, common eastward.

24. **S. compressus** Kth. (*Vilfa compressa* Trin.; *Agrostis compressa* Torr.; *Agrostis Torreyana*, E. & S.) (Gray's Manual, 6th ed., p. 647.) "Very smooth, leafy to the top; culms tufted, stout, very flat; sheaths flattened, much longer than the internodes; leaves erect, narrow, conduplicate-channeled; empty glumes acutish, about one-third shorter than the obtuse flowering one; panicle 8 to 12 inches long; spikelets 1 line long, purplish. Forming strong tussocks, 1 to 12 feet high.—Bogs on Long Island and in the pine barrens of New Jersey."

25. **S. serotinus** Gray. (Gray's Manual, 6th ed., p. 647.) "Smooth; culms very slender, flattish (8 to 15 inches high), few-flowered; leaves very slender, channeled; panicle soon much exserted, the diffuse capillary branches scattered; glumes ovate, obtuse, about half the length of the flower. A very delicate grass; the spikelets half a line long.--Sandy wet places, Maine, to New Jersey and Michigan."

26. **S. Texanus** Vasey. Contr. Nat. Herb. I. p. 57. Perennial; culms 1 foot high, rigid below, rarely branching below, the upper half occupied by the capillary panicle; leaves linear-lanceolate, rigid, 2 to 3 inches long, acuminate, rough above; the lower sheaths and ligule covered with scattered white hairs; panicle half the length of the plant, sheathed at the base, becoming diffuse, the branches capillary, mostly single and few-flowered, the lower 2 to 3 inches long; spikelets about 1 line long, on capillary pedicels; empty glumes unequal, the lower one acute, less than half as long as the upper, the latter as long as the spikelet.—Presidio County, Texas (*G. C. Nealley*).

Resembles *S. asperifolius*, but with simple, erect culms and more rigid.

27. **S. Buckleyi** Vasey. Bull. Torr. Club, X. p. 128. Culms 2½ to 3 feet high, leafy, erect; leaves 1 to 2 feet long, narrow, terminating in a long, slender point; sheaths shorter than internodes; panicle 1 to 1½ feet long, diffuse, thin, branches mostly single, sometimes the lower verticillate, 3 to 5 inches long, flowering above the middle, the branchlets short and curved; spikelets very short, glume pedicelled, lanceolate acute, the lower one-half and the second two-thirds as long as the third, the last a little shorter than the palet.—Texas (*Nealley*) to Mexico (*Pringle*).

28. **S. Bolanderi** Vasey. Bot. Gaz. XI. p. 337. Culms slender, about a foot high, decumbent below, smooth; leaves narrowly linear, flaccid; radical ones about 6 inches long; cauline ones similar, 1 to 2 inches long; ligule short and obtuse; upper half of stem naked; panicle 2 to 3 inches long, sparsely-flowered, open, lax, lower

branches in twos or threes, filiform, 1 to 1½ inches long, flowering above the middle; spikelets about 2 lines long; empty glumes unequal, 1-nerved, upper one, ovate-lanceolate, 1 line or more long, lower one one-fourth shorter; flowering glume nearly 2 lines long, oblong-lanceolate, 5-nerved, softly pubescent on the nerves below; palet equaling its glume, finely ciliate on the nerves; sterile pedicel prominent, one-third to one-half as long as the flower.—Collected at Multnomah Falls, Oregon (*Dr. H. N. Bolander*).

29. **S. confusus** Vasey. Bull. Torr. Club, xv. p. 293. (*S. ramulosus* of authors not of *Kth.*) Annual; culms 6 to 12 inches high, erect, slender, branched below; leaves mostly near the base, about 1 inch long, acute; panicle nearly as long as the plant, 4 to 10 inches long, 1 to 2 inches wide, the branches approximate, mostly single, capillary, 1 inch or less in length, erect-spreading, each with few long capillary, clavate pedicels; spikelets one-half line long; empty glumes one-half to two-thirds as long as the spikelet, mostly ciliate fringed on the margin.—Texas and Mexico and northward to Montana.

§ 4. *Culms decumbent and often rooting below; branched panicle open and spreading, perennials.*

30. **S. asperifolius** Thurb. Bot. Cal. II. p. 269. Culms 6 to 15 inches long, decumbent at base and forming extensive plats; leaves short (1 to 2 inches long), narrow, fine pointed, flat or folded; sheaths smooth, leaves sometimes rough on the margins and upper surface; ligule short and obtuse, lower sheaths inflated; panicle included at base, expanded and capillary, 3 to 5 inches long, oblong or ovoid in outline, branches fine, 1 to 2 inches long, mostly single; spikelets few, about one-half line long, on long capillary pedicles (often an inch long); empty glumes nearly equal, acute, minutely scabrous, as long as the flowering glume and palet.—Texas, northward and westward.

Var. MAJOR. Much longer, runners often 2 feet long, leaves, especially the upper ones, 3 to 4 inches long, culms longer; spikelets nearly a line long; empty glumes equal, acute, one half to one quarter shorter than the flowering glume and palet; the glumes sometimes tipped with a short point.

31. **S. auriculatus** Vasey. (S. *asperifolius* var. *brevifolius*, Contr. Nat. Herb. I. p. 56.) In habit like the preceding species, the leaves more crowded and rather shorter, the panicle longer stalked, and not so large; ligule lacerated and the outer segments acute and auriculate; panicle roundish; spikelets 1 line long, empty glumes about half as long as the spikelet, the flowering glume obtusish and mucronate tipped; the second glume often denticulate.—Texas (*C. Wright*, No. 737), also Sandy plains in Crockett County (*Reverchon*), and at Pena (*Nealley*).

MÜHLENBERGIA Schreb.

Spikelets 1-flowered, small, paniculate, articulated above the outer glumes; flowering glume with a very short, usually hairy callus. Outer glumes variable in size, from small or minute to nearly as large as the flowering glume, sometimes bristle-pointed, keeled, persistent, thin; flowering glume 3- to 5-nerved, rigid or thinnish, mucronate or awned, sometimes with a long capillary awn from the apex between the short teeth, frequently pubescent below; palet about as long as the flowering glume and of similar texture.

A. Culms generally tall, unbranched.

1. *Panicle loose and spreading, the pedicels capillary.*

1. **M. capillaris** Kth.
2. **M. affinis** Trin.
3. **M. Reverchoni** Vasey.

2. Panicle contracted.

4. **M. distichophylla** Kth.
5. **M. Emersleyi** Vasey.
6. **M. setifolia** Vasey.
7. **M. Berlandieri** Trin.

3. Panicle linear, or much contracted.

8. **M. acuminata** Vasey.
9. **M. virescens** Trin.
10. **M. gracilis** Trin.

B. Culms mostly low and slender, and with a decumbent base, panicle spreading.

11. **M. arenicola** Buckl.
12. **M. gracillima** Torr.
13. **M. pungens** Thurb.

C. Culms erect, simple or branching, panicle close or spike-like.

14. **M. comata** Thurb.
15. **M. glomerata** Trin.
16. **Wrightii** Vasey.

D. Culms weakly erect or decumbent, simple or branched.

17. **M. Willdenovii** Trin.
18. **M. diffusa** Schreb.

E. Culms ascending, panicle contracted, from scanty rootstocks.

19. **M. sobolifera** Trin.
20. **M. Mexicana** Trin.
21. **M. Californica** Vasey.
22. **M. Parishii** Vasey.
23. **M. Huachucana** Vasey.
24. **M. sylvatica** T. & G.
25. **M. ambigua** Torr.

F. Low plants, culms erect, branching, panicle spreading.

26. **M. Buckleyana** Scribn.
27. **M. Arizonica** Scribn.
28. **M. debilis** Trin.
29. **M. Texana** Thurb.

H. culms branching, wiry, panicle contracted.

30. **M. Neo-Mexicana** Vasey.
31. **M. pauciflora** Buckl.
32. **M. Lemmoni** Scribn.
33. **M. Pringlei** Scribn.
34. **M. monticola** Buckl.
35. **M. parviglumis** Vasey.

Anomalous:

36. **M. dumosa** Scribn.
37. **M. depauperata** Scribn.

1. **Muhlenbergia capillaris** Kth. (*Stipa diffusa* Walt.; *Stipa sericea* Michx.; *Stipa capillaris* Lam.; *Agrostis setosa* Willd.; *Agrostis sericea* Ell.; *Podosæmum capillare* Desv.; *Trichochloa capillaris* DC.) (Gray's Manual, 6th ed., p. 644.) Culms 2 to 4 feet high,

leaves long, nearly equaling the culm, erect, narrow, and becoming involute; panicle 1 to 2 feet long, open and spreading, the branches capillary, 6 to 10 inches long, distantly subdivided, pedicels ¼ to 1½ inches long; empty glumes one-fourth to one-half as long as flowering glumes, obtusish or acute, with or without an awned point; flowering glume about 2 lines long, narrow, with an awn two to four times as long as itself.—New England to Missouri, south to Florida and Texas.

Var. FILIPES Chapm. (*Muhlenbergia filipes*). Curtis; both glumes long-awned; flowers light-colored.—Florida.

Var. TRICHOPEDES (*Agrostis trichopodes* Ell.; *Muhlenbergia trichopodes* Ell.; *Muhlenbergia expansa* Trin.), empty glumes not awn-pointed, awn of flowering glume short.

2. **M. affinis** Trin. Agrost. II. p. 55. Culms simple, very slender, naked above the middle; sheaths longer than the internodes, scabrous downward; ligule 2 to 2½ lines long; leaves linear, compressed, 5 inches long, pale glaucous; panicle 8 inches long, spreading, shining, branches solitary, or in threes or fives, capillary, lower ones about 3 inches long, naked below for 6 to 9 lines, above open-branched, pedicels sometimes shorter, sometimes 2 or 3 times longer than the spikelets, the latter 2 lines long; empty glumes one-third as long as the flowering glume, the latter glabrous, with a short, hairy callus and an awn 4 to 5 lines long.

This is Trinius's description, and seems to answer to specimens from Texas, collected by *G. C. Nealley*. We have the same also from Arizona (*J. D. Emersley*).

3. **M. Reverchoni** Vasey & Scribn. Culms 1½ to 2 feet high, slender, erect, upper half naked; radical leaves 3 to 5 inches long, flat, involute toward the apex, scabrous on the upper surface, ligule 1 to 2 lines long, cauline leaves about two; panicle pyramidal, 5 to 8 inches long, thinly flowered, the lower branches about 3 inches long, mostly solitary, subdivided nearly to the base, capillary, pedicels as long as, or 2 to 3 lines longer than the spikelets; empty glumes one-third or one-half as long as flowering glume, acute; flowering glumes 2½ lines long, the awn rather shorter. Distinguished by the short, flat leaves.—Texas (*Mr. J. Reverchon*).

4. **M. distichophylla** Kth. Enum. Plant, I. p. 202. Perennial, culms firm, 3 to 3½ feet long, including panicle, leafy; leaves distichous, the lower two-thirds as long as the culm; condupulicate, rigid, scabrous, sheaths compressed, smooth, ligule 5 or 6 lines long, acute; panicle contracted, 6 to 15 inches long, rather dense, about an inch wide, branches scattered or verticillate, erect, 1 to 3 inches long, about the lower third naked, above with short, erect subdivisions; spikelets 1½ lines long; empty glumes as long as the flowering glumes, or slightly longer or shorter, linear-oblong, thin, obtuse; flowering glume slender, smooth or nearly so, awn 3 to 6 lines long, or absent.—Western Texas to Arizona (?).

The awnless form has shorter empty glumes. The awned one has the long glumes of an Epicampes. There is some doubt whether our plant is the one described by Kunth.

5. **M. Emersleyi** Vasey n. sp. Culms 3 to 5 feet high, stout; leaves long, scabrous, 1 to 2 feet long, rigid, 1 to 2 lines wide; sheaths scabrous, ligule 4 to 5 lines long, lacerate; panicle ample, 1 foot long, loose, purplish, branches scattered, the lower ones verticillate, 4 to 5 inches long, naked near the base, pedicels mostly shorter than the flowers; empty glumes about 1½ lines long, one-fifth longer than the flowering glumes; acutish, thin, 1-nerved, not keeled; flowering glumes 1 to 1¼ lines long, silky pubescent, especially on the margins below, 3-nerved, the middle nerve excurrent near the apex in a slender awn 6 to 8 lines long; palet equaling its glume, pubescent on its back between the two nerves.—Southern Arizona (*J. D. Emersley*).

This has a heaver, looser panicle than *M. distichophylla*.

6. **M. setifolia** Vasey. Bot. Gaz. VI. p. 296. Culms cæspitose, 1 to 2½ feet high, smooth, radical tufts fascicled, sometimes 1 foot long, involute-filiform, awl-pointed, scabrous on the margins, culm leaves similar, gradually shorter, the upper usually sheathing the base of the panicle; panicle narrow, 6 to 8 inches long, linear and little subdivided, panicle appressed, shorter than to twice as long as the spikelets; spikelets 2 lines long, empty glumes one-third as long and erose, obtuse, thin,

about equal, the upper sometimes with a short, setaceous point; flowering glume smooth, with an awn 8 to 9 lines long, palet one-fourth shorter than its glume. The specimens described above are No. 221, of *G. C. Nealley*.

This description includes the small form collected by Dr. Havard in the Guadalupe Mountains in 1881, which is smaller, and with short-curved leaves. It is near what I supposed to be *M. Berlandieri* Trin., of which we have no authentic specimens.

7. **M. Berlandieri** Trin. Agrost. p. 53. Culms erect, about 3 feet, smooth, simple; sheaths much longer than internodes, scabrous, ligule 2 to 3 lines long, leaves linear, firm, lower ones 6 inches long, plain or convolute, pale glaucous; panicle lanceolate, 10 inches long, shining; common axis scabrous downwards, branches single or in twos or threes, scattered, rough, soon subdivided above the base; pedicels short or twice as long as spikelet; spikelet about two lines long, linear-lanceolate very narrow; empty glumes subequal, one-sixth as long as the flowering glume 3-nerved, very rough, hairs of the callus a little shorter than the glumes; awn about 6 lines long.—Texas. No. 1992, C. Wright, has been referred to this species.

8. **M. acuminata** Vasey. Bot. Gaz. XI. p. 337. Culms 3 to 4 feet high, slender, smooth; radical leaves involute, 6 to 12 inches long, cauline ones 3 or 4, distant, narrow, becoming involute, acuminate, scabrous, the lower 6 to 8 inches long, the upper 1 to 2 inches, ligule 3 to 4 lines long, lacerate; panicle linear, 6 to 10 inches long, interrupted, the branches sessile, verticillate, or in twos or threes, closely appressed, the lower 1 to 2 inches long, flowering to the base; pedicels and rachis scabrous, spikelets 2 lines long; empty glumes half as long, nearly equal, obtuse and denticulate at apex, membranaceous; flowering glume 2 lines long, rigid, 3-nerved, acuminate, and terminating in a minute awn, about a line long; palet as long as its glume, acute.—New Mexico (No. 1993, *C. Wright.*)

9. **M. virescens** Trin. Agrost., p. 57. Perennial; culms 1 to 2 feet high, simple, erect, rather rigid, without nodes except at the base; leaves at base 6 to 10 inches long, flat, scabrous on the margins, or some of them involute setaceous; sheaths very long, ligule narrow, 4 lines long, acute; panicle 5 to 8 inches long, contracted, not dense, erect or drooping, somewhat one-sided, branches single (in twos or threes, Trin.), erect, flowering to the base, 1 to 2 inches long, pedicels very short; spikelets about two lines long; empty glumes lanceolate, acute, the lower one-fourth shorter than upper and 1-nerved; upper as long as or a little exceeding the flowering glume and 3-nerved; flowering glume sparsely soft-pubescent below, awn flexuous, 5 to 8 lines long; callus short-pubescent; palet about equaling its glume.—New Mexico, Arizona and Mexico.

The culms are without nodes, except at the growing-point of the rhizoma.

10. **M. gracilis** Trin. Agrost. II. p. 56. Perennial; culms 1 to 2 feet high, slender, the nodes crowded at the base, scabrous; covered at the base with dry, open sheaths; leaves convolute, rigid, 4 to 6 inches long; panicle 3 to 6 inches long, flexuous, linear, narrow; branches single or in twos below, 1 to 2 inches long, flowering at the base; pedicels scabrous, very short; spikelets 1½ to 2 lines long; empty glumes unequal, the lower about one-half as long as the flowering glume, 1-nerved, acute or erose; upper glume one-third shorter than the flowering glume, 3-nerved, acute or 3-toothed, with the teeth short-awned; flowering glume, 3-nerved, pubescent or scabrous on the back, ciliate on the margins; awn 4 to 8 lines long; palet equaling its glume.—Texas, New Mexico, California and northward to British America.

Var. BREVIARISTATA (*Muhlenbergia subalpina* Vasey) much reduced, 7 to 12 inches high; panicle about 2 inches long; awn 1 to 2 lines long.—At high altitudes, Colorado and Wyoming.

11. **M. arenicola** Buckl. Proc. Acad. Phil. 1862. Culms 1½ to 2 feet high; leaves mostly short, 4 to 6 inches, linear, erect, attenuated to a fine point, folded; panicle 6 to 8 inches long, open, spreading, branches singly and in twos or threes, the lower 3 inches long, sparsely flowered, the lower fourth naked; pedicels one to three times as long as the spikelet; spikelets about 2 lines long, empty glumes half as long, obtuse or obtusely tridentate, awn of floral glume scarcely 1 line long.—From western Texas to Arizona. This has been considered by some a variety of the next species.

12. **M. gracillima** Torr. (Coul. Rocky Mt. Fl. p. 410.) Culms 6 to 12 inches high, tufted and much branched at the ground, radical leaves numerous and crowded, short (1 inch), filiform and curved; cauline about 2; panicle purplish, more than half the length of the culm; branches erect-spreading, sparsely flowered, mostly single, branched above the middle; spikelets 1¼ to 1½ lines long; empty glumes one-half to two-thirds as long, lanceolate, acuminate, or the upper 3-toothed; awn of the flowering glume about as long as the glume.—New Mexico and Texas to Nebraska.

13. **M. pungens** Thurb. (Bot. Cal. II. p. 227.) In habit like the preceding but large and coarser; culms 10 to 18 inches high; leaves 1 to 2 inches long, involute, rigid, pungently-pointed; panicle 4 to 6 inches long, pyramidal, the branches single, somewhat fasciculated, divided from the base into long-pediceled, diverging, 1-flowered rays; spikelets 2 to 2½ lines long, empty glumes about half as long, bristle-pointed, or the lower 3-toothed; awn of the flowering glume about 1 line long; palet with two setose teeth.—Texas and New Mexico to Nebraska.

14. **M. comata** Benth. (*Vaseya comata* Thurb. Bot. Cal. II. p. 278.) Culms 2 to 3 feet high; nodes slightly pubescent, not branched; leaves 5 or 6 on the culm, flat, 4 to 6 inches long, 1 to 3 lines wide, erect; ligule a short lacerate fringe; sheaths equaling or the upper shorter than the internodes; panicle 3 to 4 inches long, silvery, narrow, sometimes interrupted below, the branches sessile, ½ to 1 inch long, densely flowered; spikelets sessile or very short pediceled, 1½ lines long; empty glumes narrowly lanceolate, acute, 1½ lines long; flowering glume, nearly as long, obtuse, somewhat 2-toothed at apex, surrounded at base with copious white hairs two-thirds as long as the flowering glume; awn 2 to 3 lines long, flexuous.—Rocky Mountains, Colorado to Montana, Oregon and California.

15. **M. glomerata** Trin. (Gray's Manual, 6th ed., p. 643.) Culms 2 to 3 feet high, rather stiff, usually very leafy and often much branched; panicle 2 to 3 inches long, oblong-linear, contracted into an interrupted glomerate false spike, the branches sessile; leaves often 10 to 12, 3 to 4 inches long, narrow, rather rigid; empty glumes about 2 lines long, including the bristle-like point, hispid on the keel; palet one-half to three-fourths as long as its glume, narrow, very acute, mucronate or short-pointed.—Common.

Var. RAMOSA, stout, much branched below, very leafy.—Prairie regions.

16. **M. Wrightii** Vasey. Bull. Torr. Club, XIII. p. 53. Culms erect, or rarely somewhat decumbent below, simple or branching below, 1 to 2½ feet high, rather wiry; leaves 3 to 6 inches long, narrow, appressed; sheaths shorter than the internodes; ligules short; panicle spike-like, cylindrical, densely flowered, more or less interrupted, the lower branches of thrifty specimens ½ to 1 inch long, appressed, floriferous to the base; spikelets 1 to ¼ lines long, sometimes 2-flowered; empty glumes nearly equal, about 1 line long, with a thin ovate base, contracted into a narrow, acuminate point; flowering glume a little longer and thicker, tipped with a very short, stiff awn, ⅛ to ¼ line long, 3-nerved below, slightly pubescent; palet about as long as its glume.—Rocky Mountains, New Mexico, Arizona, Colorado and Mexico.

17. **M. Willdenovii** Trin. (Gray's Manual, 6th ed., p. 643.) Culms upright, 3 feet high, frequently much branched, slender; panicle contracted, linear, elongated, 4 to 10 inches long, loosely flowered; leaves spreading, 3 to 4 lines long; spikelets 2 lines long; empty glumes slightly unequal, about 1 line long, ovate; flowering glume 2 lines long, scabrous or pubescent; awn 4 to 5 lines long.—New England to Missouri.

18. **M. diffusa** Willd. (Gray's Manual, 6th ed., p. 644.) Culms diffusely much branched (8 to 18 inches); contracted panicles slender, rather loosely many-flowered, terminal and lateral; empty glumes extremely minute, the lower obsolete, the upper truncate; awn once or twice longer than the flowering glume.—Dry hills and woods, from New England to Michigan, Iowa and southward to Texas.

19. **M. sobolifera** Trin. (Gray's Manual, 6th ed., p. 643.) Culms 1 to 2 feet high, often much branched, slender; leaves rather short, 3 to 6 inches; panicle linear,

sometimes interrupted, the lower branches 1 inch long, appressed; spikelets 1 line long or less; empty glumes nearly equal, one-third shorter than the flowering glumes, the latter abruptly short mucronate, pubescent below, rough above.—New England to Minnesota and southward.

20. **M. Mexicana** Trin. (Gray's Manual, 6th ed., p. 643.) Culms ascending, much branched, 2 to 3 feet high; panicles lateral and terminal, often included at base, contracted, the branches densely spiked-clustered, or linear-contracted, or loose and open, 2 to 6 inches long; empty glumes slightly unequal, lanceolate, long acuminate, about the length of the very acute flowering glume, the latter about 1¼ lines long, sparsely pubescent below.—New England to Colorado and Minnesota.

21. **M. Parishii** Vasey. Bull. Torr. Club, XIII. p. 53. (*M. sylvatica* var. *Californica.*) This grass has the spreading, diffusely branched habit of *M. sylvatica*, and should perhaps be ranked as a marked variety of that species. The narrow panicles terminating the long, leafy, terminal and lateral branches are 4 to 6 inches long, the rays mostly alternate, the lower ones distant and subspicate, some of them 1 inch long, the spikelets sessile and crowed on the branches; the outer glumes membranaceous, except the hispid green keel, equal, lanceolate, acuminate, scarcely 2 lines long, rather exceeding the flowering glume without its awn; flowering glume about 1½ lines long, firm, finely scabrous, acute, and terminating in a straight awn about its own length, sparingly villose at the base; palet about as long as its glume, acute.—San Bernardino Mountains, California (*S. B. Parish*).

22. **M. Californica** Vasey. Bull. Torr. Club, XIII. p. 53. (*M. glomerata* var. *brevifolia.*) Culms 1½ to 2 feet high, erect and leafy; leaves (5 to 8 on each culm) rigid, short and wide (2 to 4 inches long, 2 to 3 lines wide), somewhat scabrous; panicle spike-like, interrupted and with longer branches below; glumes and palets about equal in length (1 line), glumes acuminate, scabrous puberulent; flowering glume acuminate and tipped with an awn half its length or less, 3-nerved, pubescent below; palet acute, about equaling the flowering glume.—Southeast California (*S. B. Parish*).

23. **M. Huachucana** Vasey n. sp. Culms tufted, much branched at base, 12 to 18 inches high, leafy; leaves 4 to 6 inches long, 2 lines wide, erect, rather rigid, scabrous; panicle 2 to 4 inches long, narrow, the lower branches sometimes in twos, all densely flowered, erect, contiguous; spikelets 2 lines long, sessile; empty glumes about equal 1½ to 2 lines long, ovate, acuminate-pointed, the long point scabrous; flowering glume about 2 lines long, 3-nerved, with a short awn; palet about as long as its glume. Both flowering glume and palet villous pubescent below.—Huachuca Mountains, Arizona (*J. G. Lemmon*).

24. **M. sylvatica** T. & G. (Gray's Manual, 6th ed., p. 643.) Culms ascending, much branched and diffusely spreading (2 to 4 feet long); contracted panicles densely many-flowered; lower glumes almost equal, bristle-pointed, nearly as long as the flowering one, the latter with an awn twice or thrice the length of the spikelet.—Low or rocky woods; common.

25. **M. ambigua** Torr. (Gray's Manual, 6th ed., p. 643.) "Culms ascending, clustering and branching, 1 foot high; panicles contracted, densely many-flowered; spikelet 2-flowered, the upper flower like the lower and perfect, or more frequently reduced to a mere awn at the base of the lower flower; lower glumes nearly equal, long pointed; flowering glume villous, as long as the flower and equaling the palet, its awn nearly twice longer.—Shore of Elysian Lake, Waseca County, Minnesota (*Geyer*)."

A remarkable species, approaching *Brachyelytrum* in the structure of the spikelet, but with wholly the habit of *Muhlenbergia.*

26. **M. Buckleyana** Scribn. (*M. Texana* Buckl.) Culms 9 to 12 inches high, much branched at the base; leaves few and near the base, linear, 1 to 2 inches long; panicle oblong-lanceolate, constituting three-fourths the height of the plant, slender, the capillary branches scattered, mostly single, erect-spreading, 1 to 2 inches long, sparsely subdivided above the middle; spikelets three-fourths of a line long, on very short pedicels; empty glumes somewhat unequal, about half a line long, 1-nerved, ovate,

acuminate, ciliate on the margins, translucent; flowering glume thin, 3-nerved, bidentate, three-fourths line long, with an awn about as long as itself; palet about equaling its glume.—Western Texas and Mexico. It has much the appearance of *Sporobolus confusus*.

* * * *Culms erect or decumbent or creeping, much branched.*

27. **M. Arizonica,** Scribn. Bull. Torr. Club, xv. p. 8. Culms closely tufted, mostly decumbent or creeping at the base with flowering culm rising successively from the same, 10 to 15 inches high; leaves one-half to 2 inches long, narrow; panicles oblong, thin, 3 to 5 inches long, capillary, the branches scattered, the lower 1 or 2 inches long, subdivided nearly to the base, the pedicels capillary, 2 to 6 lines long; spikelets about 1½ lines long, purple; empty glumes ½ line long, ovate, acute; flowering glume 3-nerved, pubescent on nerves below, bidentate at apex, the awn straight, and half line long; palet as long as its glume.—Texas and Mexico. Resembles in habit *Sporobolus asperifolius*.

28. **M. debilis** Trin. Agrost. p. 49. Culms tufted, decumbent and much branched, purplish throughout, geniculate and sending up flowering culms which are 5 to 15 inches long; leaves 1 to 2 inches long, puberulent; sheaths somewhat inflated, ligules half line long, lacerate; panicles 2 to 5 inches long, somewhat contracted, or spreading, the branches short (1½ to 1 inch long), mostly single, sessile; spikelets 1 to 1½ lines long, on very short pedicels; empty glumes nearly equal, one fourth to one-fifth as long as the floret, mostly obtuse or eroded, hyaline; flowering glume slender, tapering, scabrous throughout, terminated by a slender awn 1 to 1½ inches long; palet about equal to the flowering glume. The flowering glume and its awn are very early deciduous.—Arizona, South California and Mexico.

29. **M. Texana** Thurb. (Coul. Rocky Mt. Fl. p. 410.) Culms diffusely much branched and spreading, decumbent and geniculate; leaves about 1 to 3 inches long; panicle 2 to 4 inches long, naked below, sparsely flowered, spikelets 1½ lines long, on long capillary pedicels; empty glumes 1 line long, lanceolate, setaceously-acuminate; 1-nerved; flowering glume 1½ lines long, 3-nerved, sparsely pubescent; awn 3 to 4 lines long, palet equaling its glume, bidentate at apex.—Texas, Arizona, New Mexico to Colorado, Southern California and Mexico.

30. **M. Neo-Mexicana** Vasey. Bot. Gaz. xi. p. 337. Perennial; culms mostly branched near the base from thickened nodes, wiry, erect, 1 to 2 feet high, scabrous; cauline leaves about 5, setaceous, erect, about 3 inches long, the upper one near the panicle; ligule short, lacerate; panicle narrow, linear to lanceolate, 4 to 6 inches long, the branches unequal, mostly in twos, appressed, the longer 1 to 2 inches long, flowering to the base, the branchlets sessile and closely flowered; spikelets sessile or nearly so, about 2 lines long without the awn; empty glumes equal, more than half as long as the spikelet, lanceolate, acuminate, or awl-pointed, 1-nerved; flowering glume short-stalked, 3-nerved, narrow, acuminate, and terminating in a straight, slender awn 4 to 6 lines long.—Rocky hills and mountain sides New Mexico and Arizona.

31. **M. pauciflora** Buckl. Proc. Acad. Phil. 1862. Culm and leaves as in the preceding; panicle 3 to 4 inches long, narrow, interrupted; spikelets 2 lines long, sessile or nearly so; empty glumes half as long as spikelet, ovate below, above short, awned; flowering glume 2 lines long, with a short, blunt stipe, smooth, 3-nerved-acute, and with an awn 3 to 4 lines long.—Western Texas (No. 732, *C. Wright.*)

This closely resembles the preceding and may perhaps be a variety of it.

32. **M. Lemmoni** Scribn. Culms much branched at the base, 1½ to 2 feet high, wiry, leafy; leaves 1 to 2 inches long, 1 line wide, erect; panicles 3 to 4 inches long, linear, somewhat interrupted, branches short, erect; spikelets about 2 lines long; empty glumes lanceolate-acuminate, 1 line or more long; flowering glumes about 1½ lines long, or with the awn 2 lines; very pubescent below—Huachuca Mountains, Arizona (*J. G. Lemmon*) and Texas (*G. C. Nealley*).

Closely related to *M. Huachuacna*, of which possibly it is a small variety.

33. **M. Pringlei** Scribn. Hardly distinguishable from the preceding except by the 8 to 10 lines long awn.—Santa Rita Mountains, Arizona (*Pringle*, No. 480).

34. **M. monticola** Buckl. Proc. Acad. Phila. 1862. Culms tufted, slender, wiry, often geniculate and branched below; leaves narrow, 2 to 3 inches long; sheaths rather shorter than the internodes, ligule white, short, lacerated; panicles terminating the branches, 2 to 4 inches long, loose, branches sessile or nearly so, single, one-half to 1½ inches long; spikelets sessile, about 2 lines long; empty glumes unequal, linear-lanceolate, not awned nor pointed, the upper 1½ lines long, the lower a little shorter, both 1-nerved; flowering glume 1½ to 2 lines long, pubescent on the nerves below, awn about 8 lines long; palet equaling its glume, awl-pointed.—Texas (*S. Buckley, Havard, G. C. Nealley*), Arizona (*J. G. Lemmon and Pringle*), New Mexico (*Jones*) and Mexico (*Pringle*).

35. **M. parviglumis** Vasey. Culms 1 to 2 feet high, rarely unbranched except at the base, commonly sparsely long-branched above the base; leaves 1 to 4 lines long, involute, rather rigid, narrow; ligule short, fimbriate; panicles 4 to 7 inches long, narrow, branches single or the lower in twos and sometimes 1½ inches long, appressed, flowering to the base; pedicels very short to 2 lines long, thickened upward; empty glumes minute, nearly equal, obtuse or obtusely crenate, one-fourth to one-fifth as long as the flowering glume, the latter 1½ lines long, with 2 sharp teeth at apex, and between the teeth an awn 6 to 10 lines long.—Texas (*G. C. Nealley*).

36. **M. dumosa** Scribn. Culms suffrutescent, 3 to 6 feet high, smooth, from a thick woody rhizoma, very much branched; leaves filiform, 2 inches long, very numerous; panicles numerous on the branches, oblong-lanceolate, about 1 inch long, loosely flowered, intermingled with the leaves; spikelets about 1½ lines long; empty glumes nearly equal, about one-half line long; flowering glume narrow, terete, prominently 3-nerved, pubescent below, tipped with an awn 2 lines long; palet rather longer than the glume.—Arizona (*Pringle* and *Lemmon*), Mexico (*Pringle*) and southern California (*Orcutt*).

37. **M. Schaffneri** Fourn. Gram. Mexicanum, p. 85. Tufted, dwarf, 1 to 4 inches high, much branched, the branches linear, leafy below; leaves ½ to 1 inch long, sheaths loose; the upper part of each branch bears short, linear, 8 to 10-jointed panicles, each joint having a branch with 3 to 5 sessile spikelets; empty glumes unequal, the larger 2 lines long, 3-nerved, toothed or lacerated at apex, the smaller mostly shorter and 1-nerved; flowering glume 1½ lines long, with an awn as long; palet equaling its glume.—Arizona (*Lemmon and Pringle*) and Mexico (*Pringle*).

Var. LONGISETA Scribn. differs principally in having longer awns of the flowering glumes.—Same localities.

BRACHYELYTRUM Beauv.

Spikelets 1-flowered and with a sterile rudiment, appressed, in a simple racemose panicle; outer glumes minute, unequal, the upper and larger about half a line long, persistent; flowering glume chartaceous, rigid, produced at the apex into an awn 8 to 10 lines long; palet hyaline, 2-keeled, bifid at apex. The pedicel (continuation of the rachilla) is bristle-like, half as long as the palet, and partly lodged in the groove on its back.

1. **B. aristatum** Beauv. Culms slender, 2 to 3 feet high, from creeping root-stocks; sheaths downy, leaves broad, lanceolate, 4 to 6 inches long; spikelets 5 to 6 lines long, without the slender 8 to 10-line long awn; sterile pedicel bristle-like, one-half as long as the flowering glume.—Rocky woods, common from Maine to Minnesota.

Var. ENGELMANNI Gray. A western form with the second empty glume awn-pointed, nearly half the length of the floral one.

AGROSTIS Linn.

Spikelets 1-flowered in a contracted or open panicle; outer glumes nearly equal or the lower rather longer. and longer than the flowering glume, 1-nerved, acute, unawned; flowering glume shorter and wider, hyaline, 3- to 5-nerved, awnless, or sometimes awned on the back; palet shorter than the flowering glume, frequently reduced to a small scale or entirely wanting. Stamens usually 3. Grain free.

1. *Palet wanting or very minute.*

A. Panicle spike-like or close and short-rayed.

1. **Agrostis densiflora** (A. *mucronata* Thurb. not Presl.) Culms in tufts from an annual fibrous root, 3 to 12 inches high, rather stout; leaves mostly radical or near the base, rather rigid, erect, the uppermost 1 to 2 inches long, rough on the margins; ligule conspicuous, obtuse, decurrent; sheaths longer than the internodes, striate, rather loose, crowded at the base; panicle dense and spike-like, 1 to 3 inches long, 2 to 6 lines thick, the rays verticillate or glomerate, densely flowered, scabrous; spikelets over a line long; empty glumes equal, ovate-lanceolate, very acute or somewhat mucronate, the lower hispid on the back, and scabrous throughout; flowering glumes a quarter shorter than the empty ones, minutely toothed at apex, not awned, palet wanting or minute.—Santa Cruz, Cal. (*Dr. C. L. Anderson*). This has been distributed as *A. mucronata* Presl.

Var. ARENARIA (*Agrostis arenaria* Scribn.) Culms tufted, low (6 to 12 inches), mostly decumbent and geniculate at base, leaves 2 to 3 inches long, 1 or 2 lines or less wide; panicle varying from dense to loose and sometimes interrupted, 1 to 2½ inches long; empty glumes nearly equal, ovate-lanceolate, acute, 1 line long, scabrous throughout, hispid on the midnerve; flowering glume nearly as long as the empty ones, broadly ovate, obtusish, minutely toothed at apex, sometimes with a rudimentary awn on the back; palet minute or wanting.—Seashore, Mendocino County (*C. G. Pringle*, 1882).

This differs chiefly in being decumbent below, and with panicles less dense. In the scabrous glumes it resembles *A. verticillate.*

Var. LITTORALE (*Agrostis exarata* var. *littorale* Vasey Bull. Torr. Club, XIII. p. 54). Culms tufted, low, decumbent below, and sending out long (1 to 2 feet) short-jointed runners, leaves about 2 inches long, narrow, long-acuminate; panicle looser and more thinly flowered, the short rays sometimes spreading; empty glumes more acute, longer, and smoother; floral glume one-half to two-thirds as long as the empty glumes; palet minute, and with the 2 lodicules as long as the ovary.—Bottom lands, Washington (*W. M. Suksdorf*).

Very similar to some forms of *A. stolonifera*, which, however, has the palet as in *A. vulgaris.* It is only connected with *A. densiflora* through the var. *arenaria.*

2. **A. microphylla** Steudel. Steudel Syn. Pl., p. 164. (*Deyeuxia alopecuroides* Nutt.) Roots annual, culm erect, slender, often branched at the base; leaves short, erect, narrow; sheaths shorter than their internodes, ligule acute, decurrent; panicle lanceolate, erect, more or less dense, the very short rays verticillate or glomerate and much subdivided; empty glumes 1½ to 2 lines long, linear-lanceolate, attenuated to an awn-like point, whitish; floral glume half as long as the empty ones, narrow, minutely 4-toothed at apex with a dorsal awn about the middle, the latter 2 to 3 lines long, palet wanting.—Throughout California to Oregon and Washington.

It is difficult to determine without the original specimens whether this and the preceding are correctly named. Prof. Hackel thinks this must be the *A. mucronata* Presl., while Gen. Munroe referred it as above.

Var. MAJOR (*Agrostis exarata* var. *microphylla* Watson). Culms slender or stout, 1½

to 2½ feet high, leaves much larger, panicle 3 to 6 inches long, varying from dense and glomerate to loosely subspicate, the awned point of the empty glumes sometimes larger than the body, resembling a *Polypogon*. It is surely not *A. exarata*.—With the same range as the typical form.

3. **A. exarata** Trin. (Bot. Cal. II. p. 273.) (*Agrostis albicans* Buckl.) Culms erect, 1 or 2 feet high or more, from an annual (or perennial?) root, at length naked for some distance below the panicle; leaves mostly erect and flat, 1 to 3 lines broad, 2 to 6 or 8 inches long, the lower generally shorter, smoothish to very rough, ligule obtuse; sheaths mostly shorter than the internodes, smooth; panicle erect or nodding, narrow and dense, to open and thin, often somewhat lobed, rays verticillate and very numerous to few, of unequal length, mostly flower-bearing to the base; spikelets 1 to 2 lines long; glumes nearly equal, acute, rough on the keel; floral glume one-third to one-half shorter than the empty ones, usually 4- or 5-nerved, usually unawned, sometimes the midnerve does not extend to the apex and terminates with a short awn; palet usually shorter than the ovary or wanting; stamens 3.—Extending in some form throughout the Rocky Mountain region to the Pacific, and eastward to Wisconsin.

One of the most variable species. Different forms have received several names, including *Agrostis grandis* Trin., *A. asperifolia* Trin., and *A. pallens* Trin. *Agrostis microphylla* Steudel has also been referred to it as a variety, but I think it is a good species.

B. Panicle loose, rather narrow, rays erect.

4. **A. varians** Trin. (Bot. Cal. II. p. 273.) Culms slender, erect, from a perennial root, smooth, 6 to 12 inches high; leaves very narrow; one-half to 1 line wide, 1 to 3 inches long; sheaths mostly longer than internodes; panicle 1 to 3 inches long, purplish, the rays erect, the lower numerous, about an inch long, flowering above the middle or lower; spikelets a line long or less; empty glumes nearly equal, acute, smooth, or nearly so; palet minute or wanting.—Rocky Mountains to the Sierras. Probably this includes 2 or 3 species.

5. **A. tenuis** Vasey. Bull. Torr. Club, X. p. 21. Perennial, loosely tufted; culms 6 to 12 inches high, slender leaves numerous at the base, 1 to 2 inches long, narrow (½ line), with 2 to 3 on the culm; ligule short, obtuse, lower sheaths about equal to the ligule; panicle pyramidal, open, 2 to 3 inches long, the rays in three or fives below, above in twos or single; capillary, the longest 1 inch or more in length, becoming spreading, naked below the middle, above subdivided and few flowered; spikelets very small (less than a line), purplish, empty glumes rather unequal, acute, smoothish; floral glume thin, a little shorter than the outer, obtusish, 3-nerved above, unawned; palet very minute or wanting.—From southern California to Oregon, on mountains.

C. Panicle larger, rays longer, but still erect.

6. **A. Scouleri** Trin.? (Bot. Cal. II. p. 272). (*A. repens* Scribn.) Culms perennial from running root-stocks, 1½ to 2½ feet high, erect 4 or 5 nodes above the base; leaves 4 to 6 inches long, flat or becoming involute; sheaths about as long as the internodes; ligule 1 to 2 lines long, acute; panicle 3 to 5 inches long, lanceolate or linear-lanceolate; rays mostly in fives, unequal, the longer 1 inch or more long, naked below, the shorter ones flowering to the base; empty glumes somewhat unequal, 1¼ to 1½ lines long, acute, smooth except the midrib; floral glumes nearly as long, oblong, acute or acutish, with 5 prominent nerves, the midrib sometimes ending above the middle in a slender awn; no palet.—California to Alaska.

This is conspicuously distinguished by its running rootstocks, which are not mentioned in the original description, whereas Trinius describes *A. pallens* as being subrepent and stoloniferous. There is great uncertainty about the names of western species of *Agrostis*.

7. **A. Diegoensis** Vasey, Torr. Bull. Club, XIII. p. 55. Culms 3 to 9 from a running root-tock 2 to 3 feet high; leaves plane, 3 to 8 inches long, narrow; ligule 2 lines long; acute; sheaths shorter than the internodes; panicle 4 to 7 inches long, lanceolate, narrow; rays erect, below numerous (5 to 7), unequal, the longer 1½ to 3 inches long, flowering above the middle, equaling or exceeding the internode; empty glumes somewhat unequal, 1¼ to 1½ lines long, acute; floral glume nearly as long, 4-toothed at apex, 2 lateral nerves on each side of the midnerve, which often terminates above the middle with or without a short awn; no palet.—Santa Cruz, (*Dr. Anderson*) and San Diego County, Cal. (*C. R. Orcutt*).

This is nearly related to the preceding.

Var. FOLIOSA (*Agrostis foliosa* Vasey). (Bot. Gaz. XI. p. 337). Culms stoloniferous, 1½ to 2 feet high, very leafy, otherwise like the preceding.—Oregon (*Dr. Bolander* and *Mr. Howell*).

8. **A. Hallii** Vasey. Culms erect, stout, 2 to 3 feet high, smooth, not stoloniferous; lower leaves narrow, inclined to be involute, the upper ones flat, 3 to 6 inches long, 1 to 2 lines wide, scabrous; lingules 2 to 3 lines long, acute; panicle 6 to 9 inches long, the rays erect, spreading, the lower in clusters of 5 to many, unequal, the longer ones 2 to 3 inches, branching above the middle; spikelets 1½ lines long, somewhat appressed and crowded; empty glumes acute, 1½ to 2 lines long, scabrous on the keel; the floral glume nearly as long, with 2 tufts of hairs at the base; palet wanting.—Oregon, Washington and California.

Var. CALIFORNIA (*A. elata* Thurb. in Bot. Cal.). Culms rather stout, erect, from a perennial root, 2 to 3½ feet high, smooth; radical leaves 4 to 6 inches long, very narrow, the lower becoming involute, the upper ones flat, 3 to 6 inches long, 1 or 2 lines wide, scabrous especially below; lingules 2 to 3 lines long, acuminate; panicle open, erect, spreading, rather narrow and elongated, 6 to 10 inches long; rays unequal, on clusters of 5 to 7 below, and in pairs above, at intervals of 1½ to 2 inches, branching above the middle, the longer 2 to 3 inches long; spikelets 1½ lines long, somewhat crowded on the branches, on pedicels shorter than or twice their own length; glumes very acute, rough on the keel, floral glume nearly as long as the empty ones, with a few very minute hairs at base, obtuse; palet wanting.—California.

9. **A. virescens** H. B. K. (Bot. Cal. II. p. 274.) Culm 1 to 2 feet high or more, perennial; leaves erect, flat, about 6 inches long and 4 lines broad, rough on both sides; ligule over a line long, truncate; sheaths much shorter than the internodes, mostly smooth; panicle pale-greenish and tinged with purple, about 6 inches long and 1½ broad, the rays in clusters about an inch distant on the common axis, two or three flower-bearing above the middle, the others for their whole length; spikelets 2 lines long; glumes very acute, the lower somewhat longer, and terminated by a distinct seta exceeding ½ line in length, rough on the keel and pubescent all over; floral glume about one-third shorter than the outer ones, bearded at the base with a few short white hairs, truncate, 5-nerved, the lateral nerves projecting as distinct teeth, the central excurrent at or below the middle as a strong bent awn about 2 lines long; palet wanting or present as a very minute rudimentary scale.—California (Nos. 34, 4801, and 6079 *Bolander's*), Oregon (*Suksdorf*).

This is the description given by Dr. Thurber of a California species collected by Bolander, which has been confused with *A. exarata*.

D. panicle open, rays longer and usually spreading.

10. **A. canina** Linn. (Gray's Manual, 6th ed., p. 648.) Culms 8 to 18 inches high, with fibrous roots, radical leaves numerous, involute-setaceous, those of the culm a little broader; ligule acute; sheaths about equaling the internodes; panicle 3 to 6 inches long, erect-spreading, rays of the larger plants mostly in fives below, of the smaller ones in twos or threes, unequal, the longer an inch or more, branching above the middle; spikelets purple or brownish, mostly on short pedicels; empty glumes acute, smooth, 1 to 1½ lines long; floral glume one-fourth shorter; awned below the middle;

awn bent and exserted beyond the spikelet; palet wanting.—Mountains of New England and southward; also of California, Oregon and Washington.

Var. STOLONIFERA. Culms densely tufted and stoloniferous; leaves flat, 1 to 2 lines wide; lingule decurrent; panicle sometimes denser or less open, sometimes pale green and thinner; empty glumes more unequal, very acute; floral glumes nearly equal to the spikelets; awn straight, little exserted beyond the longer glume.—Oregon (*Henderson, Howell*).

11. **A. Oregonensis** Vasey. Bull. Torr. Club, XIII. p. 55. Culms cæspitose, not stoloniferous, about 2 feet high, somewhat slender; leaves mostly near the base, short and narrow, those of the culm shorter than the internodes, distant, narrow, 3 to 4 inches long, slender pointed; panicle 4 to 5 inches long, purple, somewhat nodding; lower rays in threes to fives, 1½ to 2 inches long, erect-spreading, naked below and rather numerously flowered at the extremities; spikelets on roughish pedicels one to three times as long, 1½ lines long, narrowly lanceolate, acute; floral glume nearly as long as the outer, acutish, 5-nerved; palet wanting.—Oregon (*Howell*) and Washington (*Suksdorf*). Resembles *A. scabra*, but has shorter panicle and rays, and usually a stouter culm.

12. **A. rupestris** All. (*Agrostis canina* var. *alpina* Oakes.) (Gray's Manual, 6th ed., p. 648.) Culms 6 to 10 inches high, roots fibrous, cæspitose, not stoloniferous; leaves all convolute-setaceous; panicle oval, purple or greenish; branches capillary, smooth; mostly in twos or threes; spikelets mostly near the extremity, less glomerate than in *A. alpina*; empty glumes a little unequal, lanceolate, sharply acute; floral glume little shorter than the empty ones, rather obtuse, with 2 small teeth at the summit, and awned a little below the middle; palet wanting.—Mountains of New England and North Carolina. Var. RUBRA. A small form occurring in Labrador and British Columbia is perhaps *A. rubra* Linn.

E. Panicle open, rays longer, spreading.

13. **A. geminata** Trin. Icones Gram. I. Pl. 28. Culms cæspitose, about 8 inches high, erect or geniculate-ascending, thin filiform, smooth, the radical ones involute-filiform, 2 to 3 inches long, those of the culm plane, about 1 inch long; panicles 2 to 3 inches long, diffuse, the axis filiform and flexuous, with 4 or 5 nodes, the rays mostly in pairs or the lower in threes or fours, dividing above the middle into several parts with divergent pedicels; empty glumes lanceolate, very acute, the lower a little the longer, floral glume one-fourth shorter, ovate-oblong, obtusish, indistinctly 5-nerved, with an awn from about the middle which is a little longer than its glume; palet shorter than the ovary (or wanting).—Alaska, probably also in an awnless form in British America and in the Rocky Mountains.

14. **A. arachnoides** Ell. (Chapm. Flora S. States, p. 522.) Culms very weak and slender, 6 to 12 inches high; leaves very narrow to 1 or 2 lines wide; panicle very long for the size of the plant (one-half to two-thirds), at first contracted, becoming diffuse, the rays capillary, mostly in twos or threes, 1 to 3 inches long; empty glumes nearly equal, lanceolate, rough on the keel; floral glume nearly equaling its empty ones, apex obtuse, with 2 minute setaceous teeth, and emitting near the apex a very fine long awn, 5 or 6 times its own length, or the awn sometimes wanting; palet minute or wanting.—South Carolina, Tennessee, to Louisiana and Texas.

15. **A. scabra** Willd. (HAIR GRASS) (Gray's Manual, 6th ed. p. 648.) (*A. oreophila* Trin.) Culms very slender, erect, 1 to 2 feet high; leaves short and narrow, mostly involute or sometimes plane, the upper ones 1 to 3 inches long; panicle purplish, 6 to 10 inches long, at first contracted, becoming very loose and spreading; rays capillary, often 3 or 4 inches long, the lower in clusters of 6 or more, branched above the middle, the subdivisions flowering near the summit; spikelets a line or more long, somewhat unequal, very acute, scabrous on the keel; floral glume shorter than the empty ones, very thin, sometimes short-awned; palet minute or wanting.—Very variable and widely diffused from the Atlantic to the Pacific.

16. **A. attenuata** Vasey. Bot. Gaz. XI. 337. Culms slender, erect, attenuated, 2 to 3 feet long, smooth; radical leaves narrowly linear, 2 to 4 inches long, those of the culm about 3, distant; sheaths shorter than the internodes, smooth; ligule conspicuous, 2 to 3 lines long; blade 2 to 4 inches long, narrow, acuminate; panicle oblong or pyramidal, 3 to 4 inches long (remarkably short for the length of the culm); lower rays in threes or fives, somewhat unequal, 1 to 2 inches long, erect-spreading, capillary, few-flowered; pedicels mostly longer than the spikelets; empty glumes equal, about 1½ lines long, oblong-lanceolate, acute, scabrous on the keel; flowering glume nearly as long, not awned; palet wanting.—In swampy ground, Mount Hood, Oregon (*Thomas Howell*).

17. **A. perennans** Tuck. (*Trichodium perennans* Ell.; *T. decumbens* Michx.) Culms more or less slender, often decumbent at base, 1 to 2½ feet high, simple or branching below; leaves flat, 1 to 3 lines wide, 2 to 6 inches long; panicle 4 to 8 inches long, diffuse, the rays 2 to 4 inches long, variable as to number, the lower often numerous and verticillate, branched below the middle; spikelets at the extremity of rather long pedicels; empty glumes rather unequal, acute or acuminate, hispid on the keel; floral glume one-fourth shorter, not awned; palet wanting.—Widely dispersed; flowers in autumn.

Var. ÆSTIVALIS. More slender, less tall; panicle longer, often occupying one-half to two-thirds of the culm, the rays more capillary and shorter, flowering much earlier (June to August).—Illinois, Tennessee, and southward.

18. **A. elata** Trin. (Gray's Manual, 6th ed., p. 648.) Culms firm or stout, 2 to 3 feet high; leaves flat, 1 to 2 lines wide; upper ligule elongated (2 to 3 lines long); panicle open, 5 to 9 inches long, lower branches in fives or more, unequal, the longer 3 to 4 inches long, flowering above the middle; spikelets somewhat crowded near the extremities of the branchlets, 1½ lines long, acute; floral glume about as long as the empty ones, acutely 2-toothed at the apex; palet wanting.—Sandy swamps, New Jersey and southward.

19. **A. Novæ-Angliæ.** (*A. scabra* var. *montana* Tuck.) Culms perennial, rather firm, somewhat geniculate below, 1 to 2 feet high, smooth; leaves of radical tufts, 4 to 6 inches long; those of the culm 3 to 4 inches long, 1 to 2 lines wide, flat, soft, smooth; ligule 1 line long, obtuse; upper sheaths very long (3 to 5 inches); panicle pyramidal or oblong, purplish, 4 to 5 inches long; lower rays mostly in fives, somewhat unequal, the longer ones 2 to 3 inches long, the upper ones in twos or threes and gradually shorter, rather few-flowered near the ends; empty glumes oblong-lanceolate, acute; floral glume nearly as long, awned near the apex.—Mountains of New England.

20. **A. Howellii** Scribn. Culms about 2 feet high, weak, geniculate and decumbent below, 3- to 5-leaved; leaves flat, 6 to 10 inches long, 3 lines wide, the upper ones equaling the panicle, rather scabrous; ligule 1 to 2 lines long, decurrent; sheaths about equal to the internodes, smooth; panicle 8 to 10 inches long, flexuous, pale or whitish, very open and thin, the lower rays in threes to fives, the upper in pairs, the longer 3 to 4 inches long, capillary, sparingly branched below the middle, distant; spikelets 1½ lines long, on rather long pedicels; empty glumes rather unequal, acute, slightly scabrous on the keel, otherwise smooth; floral glume equaling the shorter empty one, narrow, the 4 lateral nerves projecting as setaceous teeth, the stout awn near the base bent and about 2 lines long, a few minute hairs at the base; palet wanting.—Near Hood River, Oregon (No. 198, *Howell*).

F. Panicle short and dense; rays crowded.

21. **A. Rossæ** n. sp. Apparently cæspitose; culms about 6 inches high, smooth; leaves mostly near the base, 1 inch long or less, erect, or appressed; sheaths rather loose, striate, the upper reaching to the middle of the culm; panicle oblong, 1 to 1½ inches long, the comparatively long rays verticillate, erect, and appressed, ½ to ¾ inch long, subdivided above, and the few spikelets crowded at the extremities; empty glumes

1 line long, ovate-lanceolate, acute; floral glume little shorter, oblong, obtuse, minutely toothed at the apex; palet wanting.—A small species with the aspect of *Aira*, collected in the Yellowstone Park, Wyoming, by *Miss Edith A. Ross*.

22. **A. exigua** Thurb. Bot. Cal. II. p. 275. A dwarfish annual grass; the culms 1 to 4 inches high, erect, flattened, sometimes branching near the base; leaves from an inch to 2 lines long or less, mostly convolute; ligule about a line long, acute; sheaths very loose, striate; panicle half the length of the plant, included and at first narrow, at length open; lower rays about five, the others in pairs, the longer about an inch in length, bearing one to five flowers above the middle; spikelets ¼ of a line long, the pedicels much enlarged just below; empty glumes not pointed, aculeolate on the keel, and with minute scattered hairs all over; floral glume equaling the empty ones, 5-nerved, scabrous, with few very minute hairs, very acute at apex, the midnerve prolonged into a roughish awn four times longer than itself, inserted about one-fifth below the tip, which is split down to that point, forming two setæ; palet wanting; stamens 1 (?)—Foothills of the Sierras (*Dr. Bolander*). This species I have not seen.

2. *Palet at least one-third as long as its glume.*

A. Small species.

23. **A. humilis** Vasey. Bull. Torr. Club, X. p. 21. Perennial, tufted; culms 4 to 8 inches high, naked above, 1 to 2 leaves below the middle; radical leaves numerous, 1 to 3 inches long, very narrow, not rigid, erect; ligule short; panicle 1 to 1½ inches long, linear, narrow, and few-flowered, the rays short, mostly two or three below, above in twos or single, appressed, the longer rays subdivided and with two to five spikelets each; spikelets purple, less than a line long, empty glumes ovate-lanceolate, acute, smooth; floral glumes nearly as long as the outer ones, 5-nerved, minutely toothed at apex, unawned or minutely awned; palet hyaline, two-thirds as long as its glume.—Oregon (*Cusick*), Washington (*Howell* and *Suksdorf*).

24. **A. æquivalvis** Trin. (Bot. Cal. p. 271.) (*Deyeuxia æquivalvis* Benth.) Probably perennial; culm 10 to 18 inches high, slender, erect, smooth; leaves flat, the lower 4 to 6 inches long, 1 to 2 lines wide, the upper 2 to 3 inches long, smooth, pale green; upper ligules 1 line long; sheaths smooth, shorter than the internodes; panicle narrow, 2 to 3 inches long, loose, smooth, green or purple; rays mostly in fives below, somewhat distant, unequal, the larger 1 to 1½ inches long, flower bearing from about the middle; spikelets about 1 line long, on pedicels mostly as long as themselves; empty glumes nearly equal, acute; floral glume acute, nearly as long as the empty ones; palet as long or nearly as long as its glumes, with a minute hairy rudiment about one-fourth as long ("two-thirds as long," Trinius), as the floral glume.—Alaska, British Columbia, Washington, Oregon, Montana and California.

B. Larger plants.

25. **A. alba** Linn. (Gray's Manual, 6th ed. p. 647.) (*A. stolonifera* Linn.; *A. vulgaris* With.) Rootstocks creeping or stoloniferous; culm 1 to 2½ feet high (sometimes less than 1 foot), often decumbent at base; leaves flat, 2 to 6 inches long, ligule long and acute or short and obtuse; panicle 3 to 8 inches long, open, spreading in flower, more or less contracted afterward, the rays usually numerous and unequal, the longer, 1 to 3 inches long, subdivided and flowering above the middle; spikelets about 1 line long; the empty glumes nearly equal; floral glume a little shorter than the empty ones, thin, 3- to 5-nerved, awnless or rarely short awned; palet one-third to two-thirds as long as its glume.—Cultivated from Europe, but apparently also native in mountainous regions.

Var. MINOR. A shorter, densely tufted form, 1 foot high; culms geniculate below, with shorter, more slender, erect leaves; short truncate ligules, and sheaths shorter than the internodes. Probably introduced, but growing spontaneously in dry fields and waste places.

26. **A. verticillata** Vill. (Bot. Cal. II. p. 272.) Culms 1 to 2 feet high, decumbent and rooting below, the lower joints geniculate; leaves short, flat, 1 to 3 lines wide, rough; ligule 1 or 2 lines long, truncate; sheaths loose, shorter than the internodes; panicle 2 to 6 lines long, dense, lobed and interrupted; rays crowded, short, branched and flowering from the base; spikelets less than a line long; empty glumes about equal, acute, roughened with a minute pubescence; floral glume about half as long as the empty ones, 5-nerved, minutely 5-toothed at the obtuse apex; palet nearly as long as its glume.—Widely dispersed in the southwest, from Texas to California.

NOTE.—A dwarf form growing in crevices of rocks, Anticosti Island, at the mouth of the St. Lawrence River, collected by Mr. J. Macoun, is probably a new species, of which more specimens are needed.

APERA Adans.

Characters as in *Agrostis*, except that the upper empty glume is much larger than the floral glume, which is long-awned from the apex, the toothed palet nearly as long as its glume, and there is a minute, naked pedicel or rudiment of a second flower.

1. **A. spica-venti** Beauv. (Gray's Manual, 6th ed., p. 649.) (*Agrostis* Beauv. in part.) Annual, culms 1 to 2 feet high; panicle spreading or somewhat contracted; rays numerous, filiform, numerously divided; spikelets small (about 1 line long), the floral glume roughened toward the apex.—Sparingly naturalized on ballast ground.

GASTRIDIUM Beauv.

Spikelets 1-flowered in a loose, tapering, spike-like panicle; outer glumes extended into long, acute points, and with an enlarged ventricose base, obscurely keeled, the lower longer than the upper; flowering glume very thin, about one-fourth as long as the outer ones, hairy on the back, truncate and dentate at the apex, usually emitting from near the apex a slender awn as long as or longer than the glumes; palet thin, as long as its glume. A sterile pedicel at the base of the flower.

1. **G. australe** Beauv. (Bot., Cal. II. p. 275.) (*G. lendigerum* Gaudin.) Culm 6 inches to 2 feet high, smooth, branching at the lower nodes, geniculate; leaves flat, 2 to 5 inches long, about 2 lines wide; sheaths rather shorter than the internodes; ligule 2 lines long, lacerate-fringed; panicle 3 to 6 inches long, about ½ inch wide, sometimes lobed, shining, pale green; spikelets about 2 lines long, very acute; empty glumes slightly scabrous above, shining below; floral glume hairy; palet equaling the glume.—Introduced and very common in Australia.

CALAMAGROSTIS Roth.

Spikelets in a contracted, spike-like, or open panicle, with or without a bristle-like or hairy rudiment opposite the palet; empty glumes about equal, awnless, membranaceous or chartaceous; flowering glume usually with a ring of hairs surrounding its base, or a tuft on each side, and usually bearing an awn on the back; palet 2-nerved, 2-keeled. The spikelets usually larger than in Agrostis.

§ 1. Deyeuxia Hack.

Hairs of the callus seldom exceeding the glumes, sometimes very short; the sterile pedicel also very hairy.

A. Panicle small, loose, and spreading, with few rays.

1. Calamagrostis deschampsioides Trin. (Bot. Cal. II. p. 280.) Culms tufted from a decumbent base, 6 to 10 inches high, smooth; leaves flat or somewhat convolute, smooth, the lower 4 to 6 inches long, the upper about 1 inch; panicle small ovate or pyramidal; rays mostly in pairs or threes, divided above the middle, and bearing about 5 flowers; spikelets 2 lines or more, purple tinged; empty glumes equal, broadly lanceolate, acute; floral glume about as long as the empty ones; acuminate 2-toothed, bearing above the middle a stout awn, which slightly, or one-third, exceeds its glume; hairs of the callus and of the rudiment one-half as long as the glume or less; palet equaling the floral glume.—Alaska and Arctic America.

2. C. Breweri Thurb. (Bot. Cal. II. p. 280.) Culms densely tufted, 6 to 15 inches high, erect, very slender; radical leaves 2 to 3 inches long, setaceously-involute, minutely scabrous above, the upper very short; upper ligule acute, 2 lines long; sheaths close, striate; panicle loose, 1 to 3 inches long, purple rays solitary or in twos or threes, spreading, short, 1- to 3-flowered at the extremities; spikelets 1½ to 2 lines long, lanceolate, acute; floral glume equal to empty ones, with acute or lacerate teeth at the apex, with a short, minute tuft of hairs at the base, awned from near the base, exserted nearly a line beyond the apex; palet nearly equaling its glume, 2-toothed at apex.—Sierras of California (*Bolander*, *Brewer* and *Lemmon*).

B. Panicle larger with long spreading or somewhat contracted rays.

3. C. Howellii Vasey Bot. Gaz. VI. p. 271. Culms densely tufted, 10 to 20 inches high, erect, or somewhat geniculate below, smooth; radical leaves loosely setaceous involute, firm but not rigid, in length nearly equaling or even exceeding the culm, ligule conspicuous, about 1½ lines long, scarious, culm leaves about 3, narrow or filiform, 4 to 8 inches long, the upper one equaling the culm; panicle pyramidal, 2 to 4 inches long, loose and spreading, rays mostly in fives, lower ones 1 to 1½ inches long, numerously-flowered above the middle; spikelets pale-green or purple-tinged; outer glumes lanceolate, acute, 2½ to 3 lines long, nearly equal, membranaceous, 1-nerved or the upper distinctly 3-nerved, flowering glume slightly shorter than the outer ones, ovate-lanceolate, acute, 4-nerved above, the apex with 2 mucronate pointed teeth, the conspicuous strong awn inserted about the lower third, half an inch long, palet rather shorter than its glume, bidentate at the apex, basal hairs about half as long as the flower, those of the rudiment rather longer.—Oregon and Washington.

A well marked and handsome species, remarkable for the long setaceous leaves, both radical and cauline, and for the open panicle and conspicuous awns. It was named for the discoverer, *T. J. Howell*, Oregon.

4. C. pallida Vasey & Scribn. Culms 4 feet high, with 6 or 7 nodes; leaves 2 to 4 lines wide, 6 to 9 inches long; sheaths striate, shorter than the internodes; ligule about 2 lines long, lacerate at apex; panicles 6 or 7 inches long; loose and spreading, whitish or very pale, the rays capillary, mostly in fives, the longer 2 inches long, flowering near the extremity of the branchlets; spikelets 1 to 1½ lines long, somewhat unequal, long acuminate-pointed, pedicels, branches and midnerve of glumes scabrous; floral glume one-fourth shorter than the empty ones, very thin, acutely toothed at apex; hairs of the callus and rudiment about equaling the glume, very fine; awn slender and short, attached near the apex and extending half a line beyond.—Washington (*Suksdorf.*)

5. C. Bolanderi Thurb. Bot. Cal. II. p. 280. Culms 2 to 3 feet high, geniculate below, more or less scabrous throughout; leaves, 4 or 5, flat, 6 to 10

inches long, 2 to 4 lines wide, pale, yellowish-green; ligule 2 lines long, truncate, erose or lacerate; sheaths mostly shorter than the internodes, loose; panicle 3 to 8 inches long, loose, dark purple becoming brownish; rays in threes and fives; the lower 2 to 4 inches long, very slender, rather erect, at length spreading or even deflexed, the branches sparsely flowered above the middle, spikelets 1½ lines long on slender pedicels; empty glumes equal, oblong-lanceolate, acutish or rather obtuse, rough on the keel; floral glume little shorter, sometimes roughish-tuberculate, the lateral nerves projecting at the apex as teeth; hairs of the callus few and unequal, about one-third as long, and those of the rudiment more than half as long as the glume, awn attached near the base, stout, extending a line beyond its glume; palet slightly shorter, broad, 2-nerved, 2-toothed.—Swamps, Mendocino County, Cal. (No. 6471 *Bolander*).

C. Panicle ample, loose and open, with short, erect, or drooping rays. (*Exception in var. of C. Aleutica.*)

6. **C. Canadensis** Beauv. (BLUE JOINT). (Gray's Manual, 6th ed., p. 650.) Culms erect, smooth, 3 to 5 feet high, rarely branching below; leaves about a foot long, 2 to 4 lines wide, flat; ligule short, lacerate; sheaths appressed, shorter than the internodes; panicle 3 to 6 inches long, the axis and rays scabrous; spikelets from 1¼ to 1¾ lines long; empty glume somewhat unequal, lanceolate, acute; floral glume nearly as long, acute or obtushish, 2-toothed at apex, hairs of callus and rudiment about equaling the glume, awn very slender, arising from about the middle, equaling or little exceeding its glumes; palet a little shorter; quite variable in the size and looseness of the panicle. Widely spread throughout most of the United States and British America to Alaska.

Var. DUBIA (*Calamagrostis dubia* Scribn.). Culms more slender, panicle narrower and closer, hairs of the floret one-half as long as the floral glume, awn stouter and usually longer than in *C. Canadensis*.—Montana (*Scribner*) to Washington (*Suksdorf*).

7. **C. dubia** Scribn. Bot. Gaz. XI. p. 174. Culms 2 to 3 feet high, rather slender; leaves much as in *C. Canadensis*; panicle contracted 5 to 6 inches long, the branches less spreading and more densely flowered than in *C. Canadensis*, unequal and flower-bearing mostly to the base; spikelets about two lines long, brown or purplish; empty glumes lanceolate to oblong-lanceolate, acute or acuminate, minutely scabrous on the back; floral glume ¼ shorter, irregularly 4-toothed at apex, the straight rather stoutish awn attached below the middle, longer than its glume and equaling the outer glumes; palet nearly as long as its glume, irregularly two-toothed; hairs of the callus and rudiment one-half to two-thirds as long as the floral glume.—Montana to Oregon and Washington.

8. **C. Langsdorffii** Trin. (Gray's Manual, 6th ed., p. 650.) "Culm, leaves, and panicle as in *C. Canadensis*; spikelets 2 to 3 lines long; glumes lanceolate or oblong-lanceolate, attenuate-acuminate, often cinereously strigose-pubescent; awn stouter than in the preceding, and often slightly exceeding the floral glume."—Labrador, White Mountains, New Hampshire, Oregon to Alaska.

9. **C. Aleutica** Trin. (Bot. Cal. II. p. 282.) Culms stout, densely tufted, 2 to 5 feet high, erect, smooth; leaves erect, rather rigid, those of the culm flat, long-attenuate, a foot (or two) long, and 4 or 5 lines wide, rough; ligule ovate or truncate; sheaths loose, mostly shorter than the internodes; panicle 6 to 10 inches long, 1 to 2 inches wide, loose, or sometimes rather close; rays in crowded clusters, the longer 1 to 3 inches long, erect or erect-spreading, mostly flower-bearing to the base; spikelets 2½ to 3 lines long, mostly exceeding the pedicels, pale or brownish; empty glumes nearly equal, lanceolate, acuminate, membranaceous, roughish; floral glumes like the outer in texture, and but slightly shorter, obtuse or acutish, 4-toothed and lacerate, nearly smooth, its awn inserted just below the middle or near the base and barely as long; hairs of the callus and minute rudiment scarcely half as long as the glume; palet nearly as long as its glume, shortly 2-toothed, 2-nerved.—Near the coast, from Santa Cruz, northward to Washington and Alaska.

Var. ANGUSTA. Culms more slender; leaves short and narrow, rigid, and becoming involute; panicle narrow and rather dense; hairs of callus sparse and short, approaching the next section.—Santa Cruz, Cal. (*Dr. Anderson*).

10. **C. Cusickii** Vasey. Bot. Gaz. x. p. 223. Culms 3 to 4 feet high, erect from creeping rhizoma, smooth, nodes about 3, distant; radical tufts, numerous, with flexible curving leaves one-third as long as the culm; sheaths smooth, 4 to 5 inches long, the upper one 7 or 8 inches; ligule conspicuous, 2 to 4 lines long, membranaceous; panicle 6 inches long, erect, rather close, ¾ to 1½ inches wide, the branches whorled, numerous, mostly short, and flowering to the base, the longer ones 1 to 1½ inches long, densely flowered, the lower whorls about 1 inch distant; spikelets closely approximated, very short, pediceled; outer glumes about 2 lines long, acute or acuminate, smooth, rather thin; the lower one 1-nerved, the upper 3-nerved and a little shorter; flowering glumes nearly as long as the outer ones, narrowly lanceolate, acuminate, smooth, thinnish, 5-nerved, bifid at the apex; awn erect, inserted a little below the middle, slightly exceeding its glumes; palet nearly equaling the glume, membranaceous; hairs scanty, one-half to two-thirds as long as the flower; near *C. Aleutica*, but distinguished by rather smaller and more crowded spikelets and longer awns.—In the Eagle Mountains (*W. C. Cusick*) and eastern Oregon, at an altitude of 5,000 to 6,000 feet, growing in the shade of *Pinus contorta*, very conspicuous, but rarely sending up culms.

11. **C. Pickeringii** Gray. (Gray's Manual, 6th ed., p. 651.) Culms 1 to 1½ feet high; leaves short, erect, rather rigid; panicle lanceolate, or pyramidal, purplish; empty glumes ovate-oblong to ovate-lanceolate, bluntish or abruptly pointed, 1½ to 2 lines long, thickish; floral glume nearly as long, acute, bearing below the middle a short stout awn slightly longer than the glume, hairs of the callus and rudiment very short and scant, ¼ or ⅛ the length of the glume.—White Mountains, New Hampshire, and Vermont (*Pringle*).

12. **C. Porteri** Gray. (Gray's Manual, 6th ed., p. 650.) Culm slender, 2 to 4 feet high; leaves 6 to 10 inches long, scabrous below, tapering to a long slender point, ligule 2 lines long, lacerate; a pubescent or woolly ring at the junction of the sheath and leaf on the back; panicle long and narrow, the rays appressed; empty glumes lanceolate, rather unequal, acute, pale, 2 to 2½ lines long; floral glume as long as the upper empty one, firm, membranaceous, bearing below the middle a stoutish, twisted awn of its own length, hairs of the callus scanty, less than half as long as the glume, those of the rudiment half as long as the glume.—Dry woods, Pennsylvania (*Porter*), to New York (*Dudley*).

13. **C. Macouniana** Vasey. (Bot. Gaz., x. p. 297, as *Deyeuxia*.) Culms 2 to 3 feet high, erect, somewhat branching below, slender, leafy; leaves narrow, flat, 6 to 10 inches, alternate, pointed, ligule short, lacerate; panicle 3 to 4 inches long, lanceolate or pyramidal, open, the rays mostly in fives, approximate, slender, erect, naked below, spikelets somewhat crowded at the upper part of the branches, little more than 1 line long; the empty glumes nearly equal, purplish, ovate-lanceolate, acute, finely scabrous on the back; floral glumes equal to the empty ones, ovate-oblong, somewhat truncate, and 2-lobed at the apex, the lobes finely denticulate, with an awn above the middle, straight, reaching to the apex; palet one-third shorter than its glume, bifid and denticulate at the apex; hairs copious, as long as the flowering glume.—Northwest Territory, British America (*J. Macoun*, for whom it is named). In this species the flowers are smaller than those of any other of our species.

14. **C. strigosa** Wahl. (*Arundo strigosa* Wahl.) has been attributed to Alaska, but the description of Bongard, in the "Vegetation of Sitka" does not agree with Wahlenberg's figure in Flora Lapponica. The plant referred to *C. strigosa* by Dr. Thurber, collected by Mr. Harrington in Alaska, has a large panicle, the empty glumes 2½ to 3 lines long, terminating in a long subulate point, strigosely-pubescent all over, especially so on the keel; the floral glume little shorter, acuminate, with the awn attached considerably below the middle, exserted, and equaling or slightly exceeding the glume; hairs of callus and rudiment copious, and about one-third shorter than the floral glume. In appearance like a large *C. Langsdorffi*.—Alaska.

D. Panicle spike-like, or narrow (sometimes spreading during flowering), the rays short.

15. **C. Nuttalliana** Steudel. (Gray's Manual, 6th ed., p. 650.) Culms stout, 3 to 5 feet high; leaves long, 2 to 4 lines wide, scabrous on the upper surface; panicle contracted, 4 to 6 inches long, rays short, erect, empty glumes lanceolate, tapering into slender, awl-shaped tips, 3 lines long, very scabrous; floral glume a little shorter, acuminate, strongly nerved, awn borne above the middle, stout, slightly exceeding the glume; palet linear-lanceolate, acuminate, nearly equaling its glume; hairs of the callus scanty, half as long, and those of the tuft on the top of the rudiment copious and nearly equaling the glume; grain-bearded at the summit.—New England, New Jersey, Pennsylvania, to Virginia, North Carolina and southward.

16. **C. confinis** Nutt. (Gray's Manual, 6th ed., p. 650.) (*Calamagrostis inexpansa* Gray; *Deyeuxia confinis* Kth.) Culms 2 to 4 feet high, smooth except near the panicle; leaves flat, or becoming more or less involute, scabrous; panicle elongated, 4 to 6 inches long, the scabrous rays spreading at flowering time, afterwards appressed; empty glumes thickish, more or less scabrous, lance-oblong or lance-ovate, acute, about 2 lines long, 3-nerved; floral glume nearly as long, acute, rather thin, awn from below the middle, and about equaling the glume; palet nearly equaling its glume, narrow; hairs of callus and rudiment one-third or little shorter than the floral glume.—Swamps near Lake Erie and westward to Minnesota. Appears to pass into the next species.

17. **C. robusta.** (*C. stricta* Trin.; *Deyeuxia neglecta* Kth. in part.) Culms 1½ to 2 feet high, scabrous above, rigid; leaves scabrous, involute or becoming so, the radical ones numerous, ligule narrow, 1 to 1½ lines long, obtuse; panicle strict, 4 to 6 inches long, the rays very short, sometimes glomerate; empty glumes about 1½ lines long, ovate-oblong, acute, roughish, nearly equal; floral glumes nearly as long, acute, scabrous; awn from below the middle equaling or slightly shorter or longer than its glume; palet one-fourth to one-third shorter than its glume, bifid at apex; hairs of callus and rudiment usually one-third to one-half shorter than the glume, sparse.—Throughout the Rocky Mountain region from British America and Washington to Colorado and Arizona.

18. **C. Montanensis** Scribn. Culms stoloniferous, 9 to 12 inches high, rather rigid, erect; leaves of radical tufts rigid, involute-setaceous or becoming so, 6 inches long, culm leaves similar but shorter, scabrous; panicle narrow, linear to oblong, 2 to 2½ inches long, dense; rays very short, fasciculate; empty glumes narrowly lanceolate, acute, 2 lines long or more, with the pedicels scabrous, whitish; floral glume one fourth shorter (or 1½ lines long), thinnish, finely scabrous, acutely 4-toothed, the stiff awn from the lower third about equaling its glume; palet a little shorter, bifid at apex; hairs of callus one-third as long, and those of the rudiment two-thirds as long as the flowering glume. Rather abundant.—Montana (*F. L. Scribner, R. S. Williams*).

19. **C. stricta** Trin. (*Arundo stricta* Trin.; *Deyeuxia neglecta* Kth.) Culms slender, 1½ to 2 feet high; leaves mostly near the base, slender, almost filiform, 2 to 4 inches long, one above the middle of culm, 2 to 3 inches long, ligule very short, obtuse; panicle narrow, 2½ to 3 inches long, rather sparsely flowered, much less dense than in *C. stricta;* empty glumes about 1½ lines long, linear-lanceolate, acute, thinner than the preceding; floral glume thin, one-fourth shorter than the empty glume, obtuse, minutely 4-toothed, 5-nerved below, the awn about the middle slightly exceeding the glume; palet one-fourth to one-third shorter than its glume, hairs of callus and rudiment about one-half the length of the floral glume.—Labrador (*L. M. Turner*).

Seems exactly like Scandinavian specimens of *Calamagrostis stricta* Hartmann.

20. **C. Suksdorfii** Scribn. Culms tufted, 2 to 3 feet high, smooth; leaves of culm about 3, 6 inches long, 1 to 2 lines wide, with slender acuminate points, upper ligules 1 to 2 inches long, laciniate, decurrent, lower sheaths shorter and upper ones longer than the internodes; panicle erect, 3 to 5 inches long, close or sometimes rather loose, pale or sometimes purplish, the rays glomerate, unequal, the shorter ones crowded with the almost sessile spikelets, the longer ones an inch or two long, flower-bearing

throughout; empty glumes 1¼ to 2 lines long, the lower slightly longer, oblong-lanceolate, acute, whitish, translucent, nearly smooth except on midnerve; floral glume thin, one-fourth shorter than the empty ones, oblong, obtuse, the 4 nerves terminating in as many teeth at the apex; a strong awn from near the base to a little beyond the glume; hairs of callus very few and short (¼ line), those of the rudiment twice as long, or half as long as the glume; palet about as long as its glume.—Montana, British America, Washington, Oregon and California.

21. **C. Tweedyi** Scribn. Culms robust, thick, smooth, 3 to 3½ feet high; leaves flat, unusually broad, those at the base 3 to 5 lines wide and 6 to 8 inches long, those of the culm 1 to 3 inches long; ligule 1 or 2 lines long, decurrent; sheaths loose, striate, smooth; panicle spikelike, about 4 inches long, thick, densely flowered; empty glumes 3 lines long, thinnish, lanceolate, acute; floral glume slightly shorter, lanceolate, finely scabrescent acutely 2-toothed, with a stout, twisted, and bent awn from the lower third to one-third or one-half beyond the glumes; palet as long as its glume, 2-toothed; hairs of callus very short and scanty, those of the rudiment numerous and half as long as the floral glume.—Cascade Mountains, Washington (*Tweedy, G. R. Vasey*).

Remarkable for its robust size, broad leaves, and thick panicle. Near *C. sylvatica.*

22. **C. sylvatica** DC., var. AMERICANA. Culms tufted, erect, rigid, 1 to 2 feet high; leaves rather numerous and crowded near the base, rigid, the radical ones more than half the length of culm, those of the upper culm 3 to 6 inches long, attenuate-pointed, very scabrous, thick, and more or less involute; ligule 1 line long, truncate often lacerate; sheaths rough, striate; panicle spikelike, strict, sometimes loose, 3 to 4 inches long, ½ inch wide or more, dense, generally purplish; rays mostly in fives, an inch long or less, appressed, and like the rachis very rough; spikelets 3 to 3½ lines long, on short roughish pedicels; empty glumes ovate-lanceolate, very acute, scabrous, the upper 3-nerved; floral glume slightly shorter than the empty ones, very acute or acuminate, with 4 setaceous teeth at apex, awn near the base, twisted below, bent at the middle, and exserted one-half or quite as long as the glume; palet hyaline, narrow, 2-toothed; hairs of the callus scanty, short (about ½ as long as the flowering glume), those of the rudiment ⅜ or ¾ as long as the flowering glume.—High plains and mountains, British America to Colorado, also Washington, Oregon and northern California.

This differs considerably from the European form.

Var. LONGIFOLIA. A remarkable form from the Mattole district, California. Culms densely tufted; the radical leaves as long as the culm, almost filiform and setaceously pointed, empty glumes narrow, 4 lines long, acuminate; hairs of the callus more conspicuous, one-third as long as the glume. A well-marked variety. (No. 6470 *Bolander*).

Var. PURPURASCENS Thurb. is a more slender, less rigid form.—Cal. (No. 5071 *Bolander*).

23. **C. purpurascens** R. Br. (Hooker Fl. Bor. Am. II. p. 240.) Culms tufted, firm, not rigid, 2 to 2½ feet high, leafy; leaves flat, 6 to 8 inches long, 2 to 4 lines wide, somewhat scabrous, tapering to an attenuated point; sheaths shorter than the internodes, smooth; ligule 2 lines long, lacerate; panicle spikelike, 3 to 3½ inches long, one-half inch wide, purple; empty glumes 2 to 2½ lines long, equal, broadly lanceolate, smoothish, hardly scabrous, acute; floral glume one-quarter shorter, oblong, obtuse at apex, smooth; awn at lower third and extending scarcely beyond the empty glumes; palet equaling its glume, obstusely 2-toothed; hairs of the callus very short and scanty, those of the rudiment unequal, about half as long as the glume.

This description is from specimens collected in the Cascade Mountains of Washington by G. R. Vasey, which agrees well with European specimens, although differing somewhat from the description in Hooker's Fl. Bor. Am. It occurs also in British America and in Sitka. It is not *C. sylvatica* var. *purpurascens* of Thurber.

24. **C. rubescens** Buck? Prof. Scribner has identified as this species specimens

collected by C. G. Pringle on the plains of Mendocino California, and also No. 1089 of Kellogg & Harford and No. 3 of Bolander. The culms are from strong rhizomas, and about 2 feet high, slender, naked above, radical tufts very leafy, with narrow, rigid, setaceously pointed leaves, about 6 inches long; panicle strict, purplish, 2 to 3½ inches long; empty glumes, oblong-lanceolate, barely acute; floral glumes fully as long, oblong, broadly toothed at apex; awn from below the middle, hardly equaling its glume; hairs of callus scanty and very short, the rudiment short and naked.

25. **C. crassiglumis** Thurb. Bot. Cal. II. p. 281. Culm about a foot high, erect, rigid; radical leaves nearly as long; those of the culm 3 to 4 inches long, divergent, the upper smaller, erect, usually reaching the panicle, all acute, rigid, flat below, becoming involute, strongly striate, rough; sheaths loose, smooth; panicle strict, scabrous, about 2 inches long, dense, purplish, the short, rough rays appressed; empty glumes, about 2 lines long, nearly equal, broadly ovate or ovate-lanceolate, abruptly pointed, minutely scabrous, subcartilaginous, the margins thin; floral glume about equally long, very broad, acute, obscurely toothed at apex, thickish, somewhat scabrous, the rather stout awn attached below the middle, equaling or slightly exceeding its glume; hairs of callus and rudiment about ⅔ as long; palet one-fourth shorter than its glume.—Swamps, Mendocino County, Cal. (No. 4766 *Bolander*).

26. **C. Lapponica** Trin. (Gray's Manual, 6th ed., p. 650.) (*Deyeuxia Lapponica* Kth.) "Culm and rootstocks stouter than in *C. stricta*; the narrow panicle less dense, and purplish spikelets larger; glumes fully 2 lines long, tapering to a point; awn from much below the middle of the (floral) glume, stout.—Isle Royale, Lake Superior, to Labrador, north and westward."

This is the description given in Gray's Manual for a species or supposed species of this country, which I do not fully recognize. I feel sure we have not here the *Calamagrostis Lapponica* of Wahlenberg as illustrated in the Flora Lapponica.

27. **C. densus** Vasey. Bot. Gaz. XVI. p. 144. Culms in large patches, from strong rootstocks, 3 to 4 feet high, robust, leafy, 5 to 6 nodes; the lower sheaths loose and longer than the internodes, the upper including the base of the panicle, leaves often a foot long, rigid, plane, or becoming somewhat involute at the long slender points, somewhat scabrous, as are the sheaths; ligule 1 line long, lacerate; panicle strict lance-oblong, 4 to 6 inches long, rachis slightly scabrous, branches somewhat verticillate, appressed, 1 inch long, and densely flowered; spikelets crowded, 2 to 2½ lines long; outer glumes linear-lanceolate, nearly equal, acute, slightly scabrous, margins slightly scarious; third (or flowering) glume a little shorter, narrow, apex slightly toothed and mucronate, a few short hairs at the base; awn twisted near the base, a little longer than its glumes; palet a little shorter than the glume, thin; sterile tuft slender, ⅛ to ½ as long as the glumes, with few hairs.—Near Julian, San Diego County, Cal. (*C. R. Orcutt*).

28. **C. koelerioides** Vasey. (Bot. Gaz. XVI. p. 144.) Culms erect, 2 feet high, rather rigid, smooth; leaves 2 to 6 inches, long, narrow, somewhat scabrous, ligule conspicuous, laciniate, blade rigid, pointed, the upper very short; panicle spikelike, narrow, 3 to 4 inches long, the branches in short, approximate (or at the base rather distant) clusters; spikelets about 2 lines long, linear-lanceolate, rather smaller, but otherwise much as in *Calamagrostis densus*, the panicle having much the appearance of *Koeleria cristata*.—Julian, San Diego County, Cal. (*C. R. Orcutt*).

§ 2. CALAMOVILFA Gray.

Rudiment of second flower wanting; glumes and palet rather characeous, compressed-keeled; flowering glume 1-nerved, entirely awnless; palet strongly 2-keeled; panicle at length open and loose.

29. **C. longifolia** Hook. (Gray's Manual, 6th ed., p. 651.) (*Ammophila longifolia* Benth.) Culms stout, 2 to 6 feet high, often reed-like, from strong, scaly, creeping rootstocks, smooth; leaves rigid, often 1 to 2 feet long and 10 to 12 on a culm, flat, tapering into a long attenuated point; ligule, a narrow, woolly ring, more copious

on the angles; sheaths longer than internodes; panicle at first close, becoming open and pyramidal, or widely spreading, 6 inches to 2 feet long, the rays smooth, 3 to 6 inches long, scattered on the axis, naked below; empty glumes lanceolate, 3 to 4 lines long, the lower ½ to ⅚ shorter; floral glume equaling or little shorter than the upper glume, the hairs of the callus copious, ½ to ⅔ as long as the glume.—Lake shores, Illinois, and Michigan westward throughout the plains from British America to Utah and Arizona.

30. **C. brevipilis** Gray. (Gray's Manual, 6th ed., p. 651.) (*Ammophila brevipilis* Benth.) Culms 2 to 4 feet high, from strong, scaly rootstocks, smooth; leaves at base crowded and strongly conduplicate, those of the culm narrow, with long filiform points; panicle purplish, open, spreading, 5 to 8 inches long, flowering above the middle; empty glumes unequal, ovate to oblong, acute, the upper 2 lines long, the lower about half as long, with a few short hairs external of the base; floral glumes equal, 2 lines long, sparsely hairy on the back and keels, hairs of the callus sparse, one-third as long as the glume; palet equaling its glume, sparsely pubescent.—Rare: Sandy swamps, pine barrens of New Jersey.

31. **C. Curtissii** Vasey. (Bull. Torr. Club, XI. p. 7, as *Ammophila Curtissii.*) Culms 3 to 6 feet high, from a stout creeping rhizoma, growing singly or in small tufts, the base clothed with the rigid, imbricated 2-ranked sheaths, the culm above with 3 or 4 distant leaves, involute, setaceous, 4 to 10 inches long; the ligule an obscure ciliate ring; panicle 8 to 10 inches long, narrow and strict, the rays appressed, very numerous, scattering or in twos below, loosely flowered, subdivided nearly to the base; spikelets short-pediceled, about 2½ lines long; the empty glumes unequal, linear-lanceolate, the lower ½ to ⅔ shorter than the upper; floral glume equaling the spikelet or longer, linear-lanceolate, sparsely hairy externally, the basal hairs few and very short; palet narrow, one-third shorter than its glume.—Indian River, Florida (No. 3412 *Curtiss*).

Several other species of this genus have been described or indicated by the author, but on insufficient material, and are therefore omitted. Among these are **Deyeuxia breviaristata** Torr. Bull. XV. p. 48, **D. borealis**, Macoun, and **D. Columbiana**, Macoun.

AMMOPHILA Host.

Spikelets 1-flowered, in a contracted spike-like or an open, diffuse panicle, with or without a bristle-like rudiment opposite the palet; outer glumes large, nearly equal, rigid, thick, lanceolate, acute, keeled, 5-nerved; flowering glume similar in texture, about equal in length, sometimes mucronate at the apex; palet as long as its glume, of similar texture, 2-keeled, sulcate between the keels; hairs at the base of the flower usually scanty and short.

1. **A. arundinacea** Host. (Gray's Manual, 6th ed., p. 651.) (*Psamma* Beauv.) Culms densely tufted, from firm-running rootstocks, about 2 to 3 feet high; leaves 10 to 18 inches long, rigid, becoming involute; panicle spike-like, dense, 5 to 10 inches long, cylindrical; spikelets, 5 to 6 lines long; empty glumes lance-linear, scabrous on the keels, floral glume and palet about equaling the empty ones; hairs of callus and rudiment scanty, about ¼ as long as the floral glume.—Seacoast New England to Virginia and on the Great Lakes; also San Francisco, Cal. (*J. G. Lemmon.*)

HELEOCHLOA Host.

Spikelets 1-flowered, crowded in a dense spike or spike-like panicle. Lower glumes persistent, membranaceous, acute, ciliate-carinate, awnless; flowering glume similar, a little longer, and a little exceeding the palet. Stamens 3.

Low cespitose annuals; spike often scarcely exserted from the upper sheath.

1. **H. schœnoides** Host. Culms tufted and generally prostrate, 6 to 10 inches long; leaves short, rigid, tapering to a point; spike oblong, thick, ½ to 1½ inches long.—Ballast ground, introduced; New Jersey and Delaware.

PHLEUM Linn.

Spikelets 1-flowered, in small clusters, crowded into a dense spike-like cylindrical panicle; outer glumes 1-nerved, mucronate or short-awned; flowering glume membranaceous, shorter and broader than the outer glumes, in our native species truncate and toothed at the apex; palet hyaline, narrow. In some species there is a small rudiment or bristle below the flower.

1. **Phleum pratense** Linn. (TIMOTHY.) Culms commonly 1½ to 2 feet high (exceptionally 4 to 5 feet); spike long-cylindrical; empty glumes ciliate on the back, tipped with a short bristle. Commonly cultivated; supposed to be introduced from Europe, but apparently native in mountainous districts.

2. **P. alpinum** Linn. (ALPINE TIMOTHY.) Culms 1 to 1½ feet high; spike ovate-oblong; empty glumes strongly ciliate on the back, tipped with a rough awn about their own length.—White Mountains, New Hampshire; Rocky Mountains, Colarado to California and Alaska.

ALOPECURUS Linn.

Flowers crowded in a cylindrical spike. Spikelets 1-flowered. Outer glumes strongly compressed, boat-shaped, keeled, nearly equal, frequently united at the base; third or flowering glume shorter, keeled, with a slender dorsal awn, frequently more or less united below by the opposite margins, and inclosing the stamens and styles; without a palet.

1. **A. pratensis** Linn. (MEADOW FOXTAIL.) Culms erect, smooth, 1½ to 3 feet high; leaves rather broad, the upper one short, sheaths inflated; spike erect, cylindrical, 1½ to 2½ inches long, one-third to one-half inch thick; spikelets 2 to 2½ lines long; empty glumes united for the lower third, lanceolate, acute, softly pubescent and ciliate; floral glume equaling or a little exceeding the empty ones, the margins connate for the lower half, awned near the base and the awn projecting half its length.—Introduced and cultivated.

Var. ALPESTRIS. (Wahl. Flora Lapponica, p. 21.) Culms 6 inches to 3 feet high, stout, more or less glaucous, ascending at the base, stoloniferous, with only 2 or 3 nodes above the base, the portion above the last joint very long (frequently two-thirds the entire length of the culm); leaves rather rigid, erect, 3 lines wide, 3 to 6 inches long, somewhat scabrous, sheaths rather loose, smooth; ligule 1 line long; empty glumes 3-nerved, pubescent, long ciliate on the midnerve, acute, connate to the lower third; floral glume nearly equaling the empty ones, smooth, the margins connate nearly to the middle.—Throughout the Rocky Mountain region from Colorado to Montana and Idaho. Prof. Scribner states that this species is very common in Montana at elevations of from 5,000 to 7,000 feet. I think it is too near to *A. pratensis* to be separated except as a variety.

2. **A. alpinus** Linn. Culms 6 to 15 inches high, rather stout, equally leafy with 3 to 5 nodes; sheaths loose, smooth, shorter than the internodes, sheaths short, obtuse, blade 1 to 4 inches long, erect; spike cylindrical-oblong, or oblong, dense, ⅜ to nearly an inch long; spikelets nearly 2 lines long; empty glumes covered with rather coarse

hairs, connate at the base, 3-nerved, acutish; floral glume little shorter than the empty ones, sparsely pubescent or nearly smooth, with an awn below the middle and extending one-third beyond the spikelet.—Alaska, Arctic coast and islands, to Hudson's Bay and Greenland.

3. **A. Californicus** Vasey. Bull. Torr. Club, xv. p. 13. Culms 8 to 15 inches high, weak, geniculate, ascending, sheaths inflated, smooth, shorter than the internodes; blades 2 to 6 inches long; spike cylindrical, 1 to 1½ inches long, 2 to 3 lines thick, less dense than in *A. pratensis* or *A. geniculatus;* spikelets 1½ lines long or less; empty glumes only slightly united below, obtusish or barely acute, sparsely pubescent or nearly smooth, except on the ciliate midnerve; awn from near the base, twice or thrice as long as itself; floral glume a little shorter than the empty ones, smooth, obtuse.—Santa Cruz, (*Dr. Anderson*), San Diego, Cal. (*C. R. Orcutt*).

4. **A. geniculatus** Linn. Culm ascending, often bent at the lower joints, 8 to 12 inches long, 4 to many (when prostrate) nodes; leaves 1 to 2 inches long, the upper shorter with more inflated sheath; spike 1 to 1½ inches long, 2 lines thick, cylindrical, dense; spikelets slightly more than 1 line long; empty glumes sparsely ciliate on midnerve, obtuse, connate at the base; floral glume about equal to the empty glumes, smooth, obtuse, awn from near the base, twice as long as its glume.—Introduced from Europe and naturalized in many places.

Var. ARISTULATUS Torr. (*A. aristulatus* Michx.). Culms stouter and more erect, 10 to 18 inches high, less geniculate; leaves 2 to 4 inches, attenuated to a fine point, sheaths nearly as long as the internodes; spike 1½ to 2½ inches long, densely flowered; floral glume awnless to awned, twice as long as the glumes.—Extensively distributed from the Atlantic to the Pacific.

Var. ROBUSTUS Vasey. Bull. Torr. Club, xv. p. 13. Culms geniculate below, thick, simple, or branching, 1 to 1½ feet long, smooth; culm leaves 4 or 5, nodes black, smooth; sheaths loose and inflated, 3 to 5 inches long, 3 lines wide, ligule 2 lines long, acute; spike 2 to 3 inches long, 3 to 4 lines wide, cylindrical, dense; spikelets little more than 1 line long; empty glumes little united below, the keels and lateral nerves ciliate-pubescent, obtuse and denticulate at the apex; floral glume nearly equal to the empty ones, ovate-oblong, obtuse, smooth, the margins united in the middle, awn from the middle, slender, little exceeding the glume.—Alaska, Vancouver Island and British Columbia (*J. Macoun*).

5. **A. saccatus** Vasey. Bot. Gaz. vi. p. 290. Culms 5 to 10 inches high, erect or slightly geniculate below, simple; the radical leaves short, cauline about 3, the lower sometimes extended into a filiform point, upper ones short, the sheath inflated and generally inclosing the base of the panicle; upper ligules deltoid, acute, about 2 lines long; panicle spike-like, oblong, 1 to 1½ inches long, comparatively loosely flowered; spikelets 2 lines long, the outer glumes narrowly oblong, obtuse, scarious at the apex, slightly united at the base, lateral nerves obscure, the keel and margins fringed with silky hairs, otherwise nearly smooth; flowering glume (lower palet) oblong, obtuse, smooth, equaling the outer glumes, the margins united more than half the length, forming a sack and inclosing the oblong seed, which is one-tenth of an inch long; awn twice or thrice as long as the glume, inserted near the base; spikelets, about 60 on an inch of the panicle.—Eastern Oregon (*T. J. Howell*). This species is remarkable for the large size of the spikelets and for the saccate flowering glume.

6. **A. Howelli** Vasey. Annual, 3 to 6 inches high; culms simple, erect or decumbent at the base, with two or three nodes, culm leaves about 3; sheaths about 1 inch long, striate, the lower shorter than the internodes, the upper one equaling or longer and inclosing the base of the panicle; ligule membranaceous, about ⅔ line long; blades narrow and elongated or filiform, the lower two exceeding the culm, the upper one short, lower surface strongly-nerved and finely scabrous; spike an inch long or less, cylindrical-oblong, rather densely-flowered; spikelets nearly 1½ lines long; empty glumes slightly united below, strongly ciliate on the keel and lat-

eral nerves, obtuse, a little exceeding the flowering glume, the latter smooth, oblong, obtuse, the sides united to the middle or higher, awn from near the base, about three times as long as the glume, bent at the middle. Growing in wet soil.—Oregon (*T. J. Howell*).

7. **A. Macounii** Vasey. Bull. Torr. Club, xv. p. 12. Culms 4 to 6 inches high, mostly in clusters of two or three, erect or geniculate below; sheaths 2, narrow and not much inflated, the lower one one-half to 1 inch long, shorter than its internode, the upper one 1 to 1½ inches long and much shorter than the culm; ligule membranaceous, about 1 line long, blades very short, the lower 1 inch, the upper ½ to 1 inch long, narrow, and acuminate; spike ½ to ¾ inch long; empty glumes slightly united below, coarsely ciliate on the keels, the side smooth, obtuse, a little exceeding the flowering glume, which is smooth, ovate-oblong, obtuse, the margins united to the middle or above, the awn from near the base, 2 to 3 times as long as its glume, bent at the middle.—Grows on dry rocks, at Oak Bay, Vancouver Island (*John Macoun*).

This species has a close resemblance to the preceding, but seems sufficiently marked by the difference in the leaves and sheaths and in the details of the flowers.

8. **A. cæspitosus** Trin. (Fl. Bor. Am. II. p. 257.) "Dwarf 2 to 3 inches high, spike cylindric-oblong, lax, somewhat interrupted and lobed; empty glumes united only at the very base, acutish, rather glabrous; flowering glume truncate-obtuse, awn scarcely longer than the glume; styles connate below."

This species which is figured in Trinius Icones Gram. pl. 241 (said to be from North America, and referred to in Hooker's Fl. Bor. Am. as probably of Drummond's collection in the Rocky Mountains) has not since been collected so far as I know.

LYCURUS H. B. K.

Spikelets 1-flowered, in clusters of 2 or 3 on the short branches of the spike or spike-like panicle partly included in the bract-like sheath of the upper leaf. Outer glumes membranaceous, acute, complicate, carinate toothed, not awned; flowering glume similar, keel thickish and herbaceous; palet rather shorter, compressed, 2-nerved or 2-keeled.

1. **L. phleoides** H. B. K. Culms tufted, numerous, usually decumbent at base, 8 to 18 inches high, slender, branching; leaves narrow, long-pointed; spike cylindrical, dense or lax, 1½ to 3 inches long, 3 lines thick; spikelets 2 lines long, empty glumes with a short body and teeth two or three times as long; floral glume 2 lines long, with an awn of equal length.—Western Texas, New Mexico and Arizona.

COLEANTHUS Seid.

Spikelets 1-flowered, very small, perfect, in small umbellate clusters; outer glumes wanting; flowering glume membranaceous, 1-nerved, keeled, acuminate or short aristate; palet shorter and wider than the flowering glume, 2-keeled, acutely 2-toothed. Stamens 2. Stigmas 2, sessile. A minute annual grass.

1. **C. subtilis** Seid. Culms low, 1 to 3 inches high, in loose tufts, decumbent at base, often branched below; leaves about ½ inch long, curved, smooth; ligule elongated; sheaths loose and dilated, the upper inflated; panicle ½ to 1 inch long, sheathed at the base, mostly simple, with 3 or 4 umbellate clusters; pedicels longer than the spikelets, scabrous.—Oregon (*T. J. Howell*).

PHIPPSIA R. Br.

Spikelets 1-flowered, outer glumes minute, unequal, membranaceous; flowering glume thin, three to four times longer than the outer ones, obscurely 3-nerved, keeled, acute; palet a little shorter, 2-keeled, 2- to 4-toothed at the apex.

1. **P. algida R. Br.** Culms densely tufted, ascending, 1 to 4 inches high, smooth; sheaths loose, long, striate, ligule short, obtuse, blade ½ to 2 inches long; panicle oblong to linear-oblong, loose, ½ to 1 inch long, contracted, branches short, approximate; spikelets ⅛ inch long; empty glumes minute, obtuse; floral glume and palet nearly equal, concave, broad, obtuse, apex minutely denticulate.—Arctic coast, mountains of Colorado, 11,000 feet altitude.

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SIR: I have the honor to transmit herewith, for publication as Vol. III, No. 2, of Contributions from the U. S. National Herbarium, a Preliminary Revision of the North American species of Cactus, Anhalonium, and Lophophora, by President John M. Coulter.

Respectfully,

FREDERICK V. COVILLE,
Chief of the Division of Botany.

Hon. J. STERLING MORTON,
Secretary of Agriculture.

PRELIMINARY REVISION OF THE NORTH AMERICAN SPECIES OF CACTUS, ANHALONIUM, AND LOPHOPHORA.

PREFATORY NOTE.

In the fall of 1890 Dr. George Vasey, then Botanist of the Department of Agriculture, arranged with me to prepare a revision of North American *Cactaceæ*. Owing to the peculiar difficulty of preserving material the family was poorly represented, even in our leading herbaria. To secure a large amount of additional material in the way of specimens and field notes the Department authorized me to visit the region of the Mexican boundary during the summer of 1891. Preliminary to this exploration it was necessary to examine the Engelmann collection of *Cactaceæ*, in the possession of the Missouri Botanical Garden. This collection, supplemented by the continual additions made at the garden, is by far the largest collection of skeletons and living specimens in this country, and also contains the large majority of our types.

In March, 1891, I visited this collection and made such notes as seemed necessary for use in the field, and in June, accompanied by Mr. W. H. Evans and Mr. G. C. Nealley, I began field work in the neighborhood of El Paso, Tex. After ten days of exploration it was necessary for me to leave the field work in charge of Mr. Evans, who, with Mr. Nealley, continued work westward, during July and a part of August, to southern California, along the Southern Pacific Railway. As a result a large number of complete plant bodies was secured, but very few of them were in flower and the field notes indicated little besides collecting stations. During the following fall and winter preliminary determinations of this material were made by Mr. Evans.

In the fall of 1892 critical study of this and other collections was begun in connection with my assistants, Dr. Elmon M. Fisher and Mr. Edwin B. Uline, who have ever since rendered constant and most important assistance in the examination of material and bibliography, which alone has made the work possible in the midst of other pressing duties.

In the spring of 1893 these two gentlemen spent several weeks at the Missouri Botanical Garden in the critical study of its rich material, and during the latter part of their stay I assisted in the work. Dr. William Trelease, the director of the garden, had hastened the arrangement of the Engelmann material, and had mounted in convenient form the large mass of notes left by Dr. Engelmann. These notes contained

not only critical remarks upon known species, but also the diagnoses of many unpublished species which had come into his hands, notably those collected by Mr. William Gabb in 1867 in Lower California. The collections that have thus far been studied are:

(1) Those of the Missouri Botanical Garden; and thanks are especially due to Dr. Trelease for his generous cooperation in the use of this material, without which the work would have been impossible.

(2) Those of the Department of Agriculture, including the results of several recent explorations, for the use of which I am indebted to Mr. Frederick V. Coville.

(3) Those of the Gray Herbarium at Harvard University, which Dr. B. L. Robinson kindly placed at my disposal.

(4) Those of the California Academy of Sciences, notably rich in forms from Lower California and the adjacent islands, kindly loaned by Mr. T. S. Brandegee.

(5) Those of Dr. Louis Eschanzier, of San Luis Potosi, Mexico, who sent a large series of Mexican forms collected in 1891.

(6) Numerous small sets from different correspondents, who have given both time and material in aiding the work.

It is needless to say that Dr. George Engelmann, the great pioneer student of this difficult family, has opened the paths in which we must follow, and it was exceedingly unfortunate that he was not able to complete the final revision that he had in mind.

The difficulties which beset the critical study of this group can not easily be exaggerated. Such scanty material as has been collected has been for the most part very incomplete, consisting of plant bodies without flower or fruit, flower or fruit without plant bodies, and bunches of spines without either. The species are displayed also in the most inaccessible regions, and their culmination is found in the still poorly known regions of Mexico.

On account of their singular forms and often brilliant flowers they have long been extensively cultivated, especially in Europe. These cultivated forms have formed the basis of original descriptions in almost all of the European publications, and in very rare cases have any types been preserved. As a result, the bibliography of *Cactaceæ* is appalling, and it is questionable whether satisfactory conclusions can be reached in the case of hundreds of published names. The earlier descriptions were not only meager, but were based upon what are now regarded very insufficient characters, and in the absence of types it is not only unsafe, but impossible to venture an opinion concerning their identity. In view of these facts, I have thought it advisable to present a preliminary revision of the order, which shall contain the results of the study of material confessedly insufficient. With such knowledge as we possess brought together, it is hoped that the study of this very interesting and much neglected group will be stimulated, and that more critical exploration of our southwestern territory and adjacent Mexico will

make a more satisfactory presentation possible. It would be useless to notice the vast number of reputed species that are not represented by actual specimens in our possession.

In the proposed preliminary account of the family, of which the present paper is the first part, only those genera are considered which form a part of the flora of the United States, and those species which I have been able to examine and to identify with reasonable certainty. All forms credited to the United States have been studied, and the account of these species may be considered fairly complete, but the far more numerous Mexican species are but scantily represented. The Mexican boundary is so unnatural a dividing line in the distribution of Cactaceæ that it has been disregarded, and all the species studied have been arranged in a lineal series of uniform prominence. So far as known the subject of geographical distribution is considered, but it will be seen how meager is our knowledge of this subject. It is to be hoped that this preliminary presentation will provoke exploration and study, and that species will not only be collected, but all the facts of their distribution noted. It is more than probable that our present notion of species in this group must be much modified, and doubtless many forms are at present kept specifically distinct which will prove to be but different phases of a single species.

In the matter of generic delimitation we are in still greater uncertainty, and several generic lines at present recognized must be regarded as purely arbitrary, a fact which must become still more evident with additional material. The whole group is to be regarded as made up of poorly differentiated forms and only long observation under cultivation can determine the possibilities of specific variation under the influence of environment, of age, of inherent tendencies. For instance, that these plants change in form and in spine characters with increasing age and after they have begun to flower can not be doubted, but what described forms have thus been separated in descriptions can only be guessed at.

JOHN M. COULTER.

LAKE FOREST UNIVERSITY,
Lake Forest, Ill., January, 1894.

1. CACTUS Linn. Sp. Pl. 466 (1753), restricted.

MAMILLARIA Haw. Synop. 177 (1812), not Stackh. (1809).

Usually globose to oblong plants (simple, branching or cespitose), but sometimes slender-cylindrical, covered with spine-bearing tubercles: flower-bearing areola axillary (with reference to tubercles), entirely separate from the terminal spine-bearing areola, although sometimes (CORYPHANTHA) connected with it by a woolly groove along the upper face of the tubercle: ovary naked: seeds smooth or pitted: embryo usually straight, with short cotyledons.—Originally defined by Linnæus in his *Systema*, ed. 1 (1735).

The Linnæan genus *Cactus* of 1753 included 22 species and was coextensive with the present order. In 1812 the species were separated by Haworth into five genera, the original generic name *Cactus* being discarded. Among these species *C. mamillaris* seems to have stood as the type, not only of the Linnæan genus *Cactus*, but also of Haworth's *Mamillaria*, and as such should retain the original generic name. Besides, *Mamillaria* was used as the generic name of an alga in 1809. *Cactus mamillaris* L. is the West Indian *Mamillaria simplex* Haw.

From one point of view the two sections of the genus (EUMAMILLARIA and CORYPHANTHA) deserve generic separation, for the character of grooveless and grooved tubercles seems to hold without exception, and the sections are separated with more certainty than are certain species of *Coryphantha* and *Echinocactus*. If genera are simply groups of convenience the separation should be made.

I. EUMAMILLARIA. *Flowers from the axils of the older or full-grown tubercles (hence usually appearing lateral), mostly small, and generally from whitish to pink or red: tubercles never grooved: fruit almost always clavate and scarlet.*

A. *Tubercles more or less quadrangular.*

* *Central spines not hooked.*

– *More than one central spine.*

1. Cactus alternatus, sp. nov.

Subglobose, 10 cm. in diameter, simple: tubercles long (15 to 20 mm.) and spreading, with woolly axils: radial spines 3, rigid and recurved, 5 mm. long; central spines 3, very stout and much recurved, 20 to 30 mm. long, alternating with the radials; all ashy colored and often twisted: flower and fruit unknown.—Type in Herb. Coulter.

San Luis Potosi.

Specimens examined: SAN LUIS POTOSI (*Eschanzier* of 1891).

The few spines, with the very short radials alternating with the very long and stout centrals, furnish a striking character. Occasionally one of the centrals is wanting.

2. Cactus acanthophlegmus (Lehm.) Kuntze, Rev. Gen. Pl. 260 (1891).

Mamillaria acanthophlegma Lehm. Delect. Sem. Hamb. (1833).

Subglobose with a deeply depressed vertex, or becoming cylindrical, 3 to 8.5 cm. in diameter: tubercles sharply quadrangular-conical, with densely woolly axils: radial spines 15 to 30, white, very slender (bristly) and radiant, sometimes coarse capillary, 4 to 7 mm. long, interwoven with those of neighboring tubercles and so covering the whole plant; central spines 2 to 4, robust and straight, erect or divergent, whitish or reddish, black-tipped, 5 to 6.5 mm. long: flowers reddish, 1 to 2 cm. broad: fruit unknown.—Type unknown.

From Coahuila and San Luis Potosi to Oaxaca. Fl. May.

Specimens examined: COAHUILA (*Poselger* of 1856; *Pringle* 3116 of 1890): SAN LUIS POTOSI (*Eschanzier* of 1891).

The central spines are quite variable in number and arrangement. In case there are two they are vertically placed and are either erect and parallel or widely divergent. Even three centrals may occur in the same vertical plane; but more usually the three or four centrals are arranged about a center and are widely divergent. The tubercles are apt to persist and to become naked and corky with age. The axillary wool and the capillary radials are also apt to be more or less persistent, thus giving the whole plant a woolly appearance.

3. Cactus brandegei, sp. nov.

Cylindrical: tubercles sharply quadrangular-conical, 6 to 8 mm. long, with densely woolly axils: radial spines about 10, slender and rigid, whitish with dusky tips, spreading but not radiant, 7 to 10 mm. long; central spines 3 or 4, stouter and slightly longer, erect-spreading (sometimes slightly curved), reddish-brown below, becoming blackish above: flowers small (scarcely longer than the tubercle?): fruit unknown.—Type in Herb. Calif. Acad.

San Jorge, Lower California. Fl. April.

Specimens examined: LOWER CALIFORNIA (*Brandegee* of 1889, at San Jorge).

The species has somewhat the spine characters of *C. palmeri*, but the sharply quadrangular and longer tubercles with axillary wool free from bristles suggest a very different affinity.

4. Cactus densispinus, sp. nov.

Globose, 7.5 cm. in diameter, simple: tubercles short, with woolly axils: radial spines about 25, erect-spreading, slender but rigid, yellow (brownish to black with age), unequal, 8 to 10 mm. long; central spines 6, a little longer (10 to 12 mm.) and straight, more rigid and darker, black-tipped: seeds obovate, reddish-brown, 1 mm. long.—Type in Herb. Coulter.

San Luis Potosi.

Specimens examined: SAN LUIS POTOSI (*Eschanzier* of 1891).

Very easily distinguished by its dense, erect spines, which so completely cover the plant as to give it the appearance of a large chestnut bur. Another much smaller form, which seems to be a variety, has stouter and longer ashy-white spines, the centrals darker-tipped, and the lower centrals slightly curved.

+ + *One short central spine (rarely two or none): ovaries immersed: seeds small, yellow and rugulose: juice milky: simple.*

5. Cactus heyderi (Muhlenpf.) Kuntze, Rev. Gen. Pl. 260 (1891).

Mamillaria heyderi Muhlenpf. Allg. Gart. Zeit. xvi. 20 (1848).
Mamillaria declivis Dietr. Allg. Gart. Zeit. xviii. 235 (1850).
Mamillaria applanata Engelm. Pl. Lindh. 198 (1850).
Mamillaria texensis Labouret, Monogr. Cact. 89 (1858).

Depressed-globose, usually with depressed vertex, 8 to 12 cm. broad, 2.5 to 5 cm. high: tubercles elongated: radial spines 10 to 22, whitish, 5 to 12 mm. long, the lower usually the longer, stouter, and often darker; central spine 4 to 8 mm. long, light yellowish-brown, stout, straight, and porrect: flowers 2 to 2.5 cm. long, reddish-white: fruit incurved, 1.5 to 3 cm. long. (*Ill.* Cact. Mex. Bound. t. 9. figs. 4-14)—Type unknown.

From the Guadalupe River, Texas, to the mouth of the Rio Grande, and westward to Arizona and Sonora. Fl. April, May.

Specimens examined: TEXAS (*Lindheimer* of 1845, 1847, 1853; *Wright* 226, also collections of 1849, 1852, 1853, 1855, 1856; *Bigelow* of 1853; *Trelease* of 1892; *Nealley* of 1892): NEW MEXICO (*Wright* 311; *Bigelow* of 1853; *Evans* of 1891): ARIZONA (*Pringle* of 1881): also growing in Mo. Bot. Gard. 1893; and in the World's Fair collection of *Mrs. Nickels.*

The radial spines are somewhat variable in relative length, often becoming almost equal, while sometimes the upper radials are very much reduced. The figure referred to in Cact. Mex. Bound. is not satisfactory as to the general habit of the plant, which is flat-topped rather than hemispherical.

6. Cactus heyderi hemisphæricus (Engelm.).

Mamillaria hemisphærica Engelm. Pl. Lindh. 198 (1850).

Differs in being hemisplierical instead of flat-topped, in its fewer (9 to 12) and shorter (4 to 8 mm.) radial spines, and much smaller less rough and lighter-colored seeds. (*Ill.* Cact. Mex. Bound. t. 9. figs. 15–17)—Type, the "Goebel's Garden" plants in Herb. Mo. Bot. Gard.

Throughout southern Texas and southern New Mexico, and southward; not extending so far north or west as the species, and apparently not so abundant within the United States. Fl. May.

Specimens examined: TEXAS (*Schott* 322, 614): NEW MEXICO (*Evans* of 1891): also specimens cultivated in the Goebel Garden, St. Louis, in 1847, brought from "below Matamoras on the Rio Grande" by the St. Louis Volunteers, in 1846.

On account of its convex top the variety becomes somewhat higher than the species (5 to 7.5 cm.), and the flowers are sometimes slightly longer (2 to 3 cm.).

7. Cactus meiacanthus (Engelm.) Kuntze, **Rev. Gen. Pl. 260 (1891).**

Mamillaria meiacantha Engelm. Syn. Cact. 263 (1856).

Hemispherical or with depressed vertex, 7.5 to 12.5 cm. in diameter, with a broad top-shaped base: tubercles compressed, 14 to 18 mm. long: radial spines 5 to 9 (usually about 6), stout and strongly subulate, 6 to 10 mm. long, straight or somewhat curved, whitish or yellowish, the lower mostly a little longer, the upper one sometimes wanting; central spine shorter and stout, darker, straight, and porrect, turned upwards among the radials, or rarely wanting: flowers 2.5 to 3 cm. long, reddish-white: fruit incurved, 2 to 3 cm. long. (*Ill.* Cact. Mex. Bound. t. 9, figs. 1–3)—Type specimens are those of the collections of 1847, 1851, 1852, and 1853, from which the original description was drawn and all of which are in Herb. Mo. Bot. Gard.

From the Guadalupe River, Texas, to the "Great Bend" of the Rio Grande, westward through western Texas and New Mexico; also northern Mexico (Hemsley). Fl. May, June.

Specimens examined: TEXAS (*Wright* of 1851, 1852; *Bigelow* of 1853): NEW MEXICO ("Missouri Volunteers" of 1847; unknown collector in 1880); also specimens cultivated in St. Louis in 1853, and others growing in Mo. Bot. Gard. 1893.

Dr. Englemann regarded this species as possibly only a variety of *C. heyderi*, to which it is certainly very closely allied through var. *hemispharica*, but the different tubercles and fewer stouter spines serve so well to distinguish it that it seems best to retain its specific rank.

In reference to the citation of the original description an explanation seems necessary, which will apply to numerous similar cases. The Pacif. R. Rep. iv. 27 (1856), Syn. Cact. 263 (1858), and Cact. Mex. Bound. 9 (1859), have each been cited as the original publication. The confusion has arisen from the fact that in both the publications of 1856 the description in the Rep. Mex. Bound. is referred to, and in that report the plant is fully described as "sp. nov." However, the publication of the Boundary Report was long delayed on account of the preparation of the plates, and in the meantime both the publications of 1856 had appeared, in each one of which the species is distinctly characterized and reference made to the description in the forthcoming Boundary Report. As between the two publications of 1856 the Syn. Cact. (Proc. Amer. Acad. iii. 259) was evidently distributed first.

8. Cactus gummiferus (Engelm.) Kuntze, **Rev. Gen. Pl. 260 (1891).**

Mamillaria gummifera Engelm. Wisliz. Rep. 21 (1848).

Hemispherical, 7.5 to 12.5 cm. broad and 6 to 10 cm. high: tubercles 12 to 15 mm. long: radial spines 10 to 12, the lower stout, with dusky apex, 12 to 15 mm. long, twice or thrice as long as the whitish setaceous upper ones; central spine (sometimes two) shorter (about 4 mm.), stout, dusky and porrect: flowers 3 cm. long, reddish-white, brownish-red outside: fruit unknown. (*Ill.* Cact. Mex. Bound. t. 9. figs. 18–20)—Type probably lost, as no specimens could be found in the Engelmann Herbarium.

Chihuahua, near Cosihuiriachi.

So far as can be discovered, this species has not been collected since the original Wislizenus collection of 1846–47. The plants were cultivated by Dr. Engelmann

and made to bloom, showing the flowers to be larger and darker colored than in the rest of the group, from which the species also differs in its more robust habit, its very unequal radial spines, and the occasional occurrence of two centrals.

*** Central spine hooked.*

9. Cactus uncinatus (Zucc) Kuntze, Rev. Gen. Pl. 261 (1891).
Mamillaria uncinata Zucc. in Pfeiff. Enum. 34 (1837).
Mamillaria bihamata Pfeiff. in Otto and Deitr. Gart. vi. 274 (1840).
Mamillaria adunca Scheidw. (1845–1849?).
Mamillaria depressa Scheidw. (1845–1849?).

Usually globose (occasionally depressed or even subcolumnar), 5 to 6 cm. in diameter (doubtless becoming larger): tubercles 8 to 10 mm. long, woolly in the upper axils: radial spines 4 to 6, rigid, 4 to 6 mm. long, the upper one stouter than the rest and sometimes shorter, reddish-brown and horny, straight or slightly curved, the remainder straight and white with dusky tips; central spine stout and horny, reddish-brown, 7 to 10 mm. long: flowers greenish-white or tinged with red: fruit unknown—Type unknown.

Entirely Mexican, reported from Chihuahua to San Luis Potosi.

Specimens examined: SAN LUIS POTOSI (*Gregg* of 1848; *Parry* 268; *Eschanzier* of 1891): CHIHUAHUA (*Wislizenus* of 1846–'47; also Chihuahua specimens cultivated in the Jacoby Garden in 1856 and 1857).

The variations observed in this species do not seem sufficient for the establishment of varieties. The type form seems to have been globose, with 4 radial spines and a stout central one. The depressed forms with 6 radials and a more slender central represent var. *spinosior* Lem. (*M. depressa* Scheidw.); and the subcolumnar forms with 6 radials (the upper one of which is somewhat curved) and a stout strongly hooked central represent var *biuncinata* Lem. (*M. bihamata* Pfeiff.). Such combinations of characters, however, do not hold, as any one of the plant body forms may display any one of the spine characters referred to.

B. Tubercles terete.

** Central spines none: mostly simple globose plants, with very numerous straight whitish setaceous radials.*

10. Cactus lasiacanthus (Engelm.) Kuntze, Rev. Gen. Pl. 259 (1891).
Mamillaria lasiacantha Engelm. Syn. Cact. 261 (1856).

Globose or ovate globose, 2 to 2.5 cm. high and 1 to 2 cm. broad: tubercles 4 mm. long, about 2 mm. in diameter, with naked axils: spines 40 to 60, in many series, very unequal, 2 to 4 mm. long, white and pilose, the upper exterior usually longer than the rest, the innermost usually much shorter: flowers 12 mm. long, whitish or pinkish (petals with red median band): fruit 1 to 2 cm. long: seeds about 1 mm. long, blackish and conspicuously pitted. (*Ill.* Cact. Mex. Bound. t. 3)—Type, the specimens of Wright in Herb. Mo. Bot. Gard.

From western Texas ("west of the Pecos, on low limestone hills, among herbage") to Arizona and Chihuahua. Fl. April, May.

Specimens examined: TEXAS (*Wright* 121, also of 1852; *Parry* of 1852): ARIZONA (*Miller* of 1881): CHIHUAHUA (*Pringle* 213, 250, 258): also specimens cultivated in St. Louis in 1852 and 1855.

11. Cactus lasiacanthus denudatus (Engelm.).

Mamillaria lasiacantha denudata Engelm. Cact. Mex. Bound. 5 (1859).

Larger, 2.5 to 3.5 cm. in diameter, with longer tubercles (5 to 6 mm.), and more numerous (50 to 80) longer (3 to 5 mm.) spines which are naked or nearly so. (*Ill.* Cact. Mex. Bound. t. 4)—Type, Wright specimen in Herb. Mo. Bot. Gard.

From western Texas (with the species) to Coahuila.

Specimens examined: TEXAS (*Wright* of 1852): COAHUILA (*Palmer* of 1880).

In the Syn. Cact. Dr. Engelmann merges this variety with the species, and has been followed in this by subsequent writers, but the characters seem so distinctive that its varietal rank has been restored.

12. Cactus micromeris (Engelm.) Kuntze, Rev. Gen. Pl. 260 (1891).

Mamillaria micromeris Engelm. Syn. Cact. 260 (1856).

With depressed top and very rarely branching, 1 to 3.5 cm. in diameter: tubercles very small (about 1 mm. long) and wart-like, crowded, shedding the spines with age and giving the base of the plant a tuberculated appearance: spines from white to ashy-gray, 1 to 3 mm. long; in young plants and on lower tubercles of adult plants about 20, equal and radiant; on flower-bearing tubercles 30 to 40, stellate-porrect in every direction, the 6 to 8 upper ones two to four times longer than the rest (4 to 8 mm.), clavate toward the apex and acute (the clavate top at length deciduous), intermixed with loose wool of about the same length and forming a small tuft on the top of the plant which includes and partly hides flowers and fruit: flowers whitish to light pink, almost central, very small (6 mm. in diameter), much reduced (3 to 5 sepals, 5 petals, 10 to 15 stamens, 3 stigmas): fruit 8 to 12 mm. long: seeds 1.5 mm. long, black and shining. (*Ill.* Cact. Mex. Bound. t. 1 and 2. figs. 1–4)—Type, the specimens of Wright in Herb. Mo. Bot. Gard.

On naked mountain tops and sides, extreme southwestern Texas (Val Verde County to El Paso) and southward into Coahuila and Chihuahua.

Specimens examined: TEXAS (*Wright* 227 of 1849, also of 1852; *Nealley* of 1892): COAHUILA (*Bigelow* of 1853): CHIHUAHUA (*Pringle* 212): also growing in Mo. Bot. Gard. 1893.

The plants densely covered above with delicate ashy-gray spines and with naked tuberculate base are readily recognized. It still remains an open question whether the flowers are developed from the axils of tubercles of the same season or the last ones of the preceding season. Dr. Englemann inclined to the latter view, as all the other characters of the plant associate it with the "lateral-flowered" species; and in the absence of definite observation we have retained it there. If the nearly central flowers indicate that they are produced from growth of the same season the species would seem to be allied to CORYPHANTHA, in which group its small flowers and small tubercles would be anomalous.

13. Cactus micromeris greggii (Engelm.).

Mamillaria micromeris greggii Engelm. Syn. Cact. 261 (1856).

Larger (2.5 to 5 cm. in diameter) and becoming oblong, with larger globose-ovate tubercles (2 to 2.5 mm. long), fewer rigid spines all radiant (interior 5 to 7 shorter and stouter, 1 to 2 mm. long; the outer 15 to 18. 3 to 4 mm. long), and fruit 1.5 to 2 mm. long. (*Ill.* Cact. Mex. Bound. t. 2. figs. 5–8)—Type, Gregg 508 in Herb. Mo. Bot. Gard.

Mountain ridges near Saltillo, Coahuila. Said by Budd to occur within the southern borders of Pecos County, Tex.

Specimens examined: COAHUILA (*Gregg* 508; *Palmer* of 1880).

It is a question whether this variety does not merely represent an older and better developed plant than those upon which the species is based. Mr. Harry I. Budd, who has made extensive collections of Texan and Mexican Cacti for the market, reports that it is impossible to separate sharply the variety from the species in the field, and regards the difference merely as one of age. Unfortunately, only living material of the species could be examined, but its characters seem well sustained even in the most vigorous plants, some of which reach the size of the variety. Through this variety the species is brought very near the following:

14. Cactus bispinus.

Mamillaria microthele Muhlenpf. Allg. Gart. Zeit. p. 11 (1848), not Lem. (1838).

Differs from the last form (var. *greggii*) chiefly in its cespitose habit, much larger tubercles, and two unusually stout and short central spines (*fide* Engelmann, who examined specimens in Coll. Salm–Dyck).

Credited to Mexico in general, but said by Budd to occur within the southern border of Pecos County, Tex.

** * Central spines present and one or more hooked.*

+ Mostly globose and simple plants (occasionally somewhat cylindrical).

15. Cactus wrightii (Engelm.) Kuntze, Rev. Gen. Pl. 261 (1891).

Mamillaria wrightii Engelm. Syn. Cact. 262 (1856).

Globose or depressed globose (top-shaped below), 3 to 7.5 cm. in diameter, simple: tubercles 10 to 12 mm. long, with naked axils: radial spines 8 to 12, white (the upper dusky-tipped), pubescent, 8 to 12 mm. long; central spines mostly 2 (usually side by side and divergent), rarely 1 or 3, scarcely longer, hooked and reddish-black: flowers 2.5 cm. long, bright purple: fruit about 2.5 cm. long, somewhat subglobose, purple: seeds 1.4 mm long, black and pitted. (*Ill.* Cact. Mex. Bound. t. 8. figs. 1–8)—Type, Wright of 1851 in Herb. Mo. Bot. Gard.

High plains and rocky places, from the Upper Pecos, east of Santa Fé, N. Mex., southward through extreme southwestern Texas (between the Pecos and El Paso), and into Chihuahua (near Lake Santa Maria).

Specimens examined: NEW MEXICO (*Wright* of 1851); *Rusby* of 1880): also growing in Mo. Bot. Gard. 1893.

Dr. Engelmann calls attention to the fact that this species is closely allied to the Mexican *C. zephyranthoides* (Schiedw.), but in the absence of material representing the latter species no comparison can be made. In descriptions of the Mexican species the differently colored flowers and the much longer spines suggest differences that an examination of fruit and seed characters may still further emphasize.

16. Cactus goodrichii (Scheer) Kuntze, Rev. Gen. Pl. 260 (1891).
Mamillaria goodrichii Scheer in Salm Cact. Hort. Dyck. 91 (1850).

Globose or ovate, 5 to 7.5 cm. high, subsimple: tubercles ovate, short (3 to 5 mm.), somewhat corky and persistent, with dense wool in the young axils containing 5 to 8 stiff bristles: radial spines 11 to 15 (the uppermost one sometimes wanting), white and rigid, 5 to 7 mm. long, entangled with adjoining clusters; central spines 3 or 4 (often solitary in young plants), brownish-black, the upper ones divergent and straight (rarely showing a tendency to hook), the lower longer (9 to 10 mm.), stouter and hooked (usually upwards): flowers 12 to 18 mm. long, the petals yellowish-white with red midribs: fruit clavate and scarlet. (*Ill.* Cact. Mex. Bound. t. 8. figs. 9–14)—Type: Scheer says that the plant was brought from the Island of "Corros" (Cedros?) by Dr. Goodrich, and "unfortunately perished in the gardens," which generally means that there is not a fragment of the type in existence.

In dry ravines, from San Diego County, California, southward throughout Lower California and the neighboring islands (including Guadalupe Island). "Llavina."

Specimens examined: CALIFORNIA (*Parry* of 1850, 1875; *Agassiz* of 1872; *Parish* 450 of 1882 at Vallecito): LOWER CALIFORNIA (*Gabb* 18 of 1867; *Brandegee* of 1889 on Magdalena Island, and 240 of 1890 from San Jose del Cabo): also specimens cultivated in Gard. Salm–Dyck.

By a misprint in Cact. Mex. Bound. the specific name appeared as "Goodridgii," and this error appears in almost every subsequent mention of the species, even in Watson's Bibliographical Index, although in Syn. Cact. and other references by Dr. Engelmann the correct form appears.

17. Cactus pondii (Greene).
Mamillaria pondii Greene, Pittonia, i, 268 (1889).

Oval or cylindrical, from low to 30 cm. high, simple or sparingly branched: radial spines 20 to 30, white and slender; centrals 4 or 5, the longest over 25 mm. long, rigid and strongly hooked, dark brown above the middle: flowers nearly 5 cm. long, bright scarlet: fruit unknown.—Type, Pond specimens in Herb. Greene.

Cedros Island, off the west coast of Lower California. Fl. February.

Unfortunately, the type specimen has been mislaid, so that no examination of it could be made. Evidently related to *C. goodrichii*, but differing in its much more robust habit, more numerous radials, much longer spines, and larger scarlet flowers.

18. Cactus barbatus (Engelm.) Kuntze, Rev. Gen. Pl. 261 (1891).
Mamillaria barbata Engelm. Wisliz. Rep. 22 (1848).

Depressed-globose, about 4 cm. in diameter, simple: tubercles 8 mm. long, with naked axils: radial spines very numerous (50 to 60), in two series, 6 to 8 mm. long, the outer (about 40) slender but rigid and white, the inner (10 to 15) a little stouter and yellow; usually one central spine, stout and erect, hooked downwards, brownish: flowers 18 to 20 mm. long, rose-red: fruit oblong, 10 to 12 mm. long, green (when mature?)

seeds minute, dark brown and lightly pitted. (*Ill.* Cact. Mex. Bound. t. 6. figs. 9–12)—Type, Wislizenus of 1846 in Herb. Mo. Bot. Gard.

Central Chihuahua. Fl. May, in cultivation.

Specimens examined: CHIHUAHUA (*Wislizenus* of 1846, 1850): also specimens cultivated in Baumann's Garden in 1857, 1858; also growing in Mo. Bot. Gard. 1893.

Dr. Engelmann observed a curious intermediate character in the origin of the flowers of this species, the first ones of the season appearing in the axils of the last tubercles of the preceding year, while the later ones develop from the axils of the first tubercles of the same season. The specimen growing in Mo. Bot. Gard. in 1893 had 3 central spines, one or two being hooked.

19. Cactus grahami (Engelm.) Kuntze, Rev. Gen. Pl. 260 (1891).

Mamillaria grahami Engelm. Syn. Cact. 262 (1856).

Globose or at length ovate, 2.5 to 7.5 cm. high, simple or branched from the base and even cespitose: tubercles ovate, 6 mm. long, dilated at base (corky and persistent when old), with naked axils: radial spines 15 to 30 in a single series, white, often dusky-tipped, slender but rigid, naked or puberulent, 6 to 12 mm. long, the shorter ones uppermost, the longer ones lateral; central spines 1 to 3, blackish from a paler base, the lower (often the only) one stouter and longer (6 to 18 mm.), hooked upward, the one or two upper ones (when present) shorter and slenderer, divergent: flowers 2 to 2.5 cm. long, rose-colored: fruit 2 to 2.5 cm. long: seeds 0.8 to 1 mm. long, black and pitted. (*Ill.* Cact. Mex. Bound. t. 6. figs. 1–8)—Type, Wright of 1852 and Bigelow of 1852 in Herb. Mo. Bot. Gard.

In rocky places, from the mountains of extreme southwestern Texas (west of the Pecos) to southern Utah, southern Califorinia (common along the Colorado), and Sonora. Fl. June–August.

Specimens examined: TEXAS (*Wright* of 1852; *Newberry* of 1858; *G. R. Vasey* of 1881; *Miller* of 1881; *Briggs* of 1892): NEW MEXICO (*Evans* of 1891): ARIZONA (*Bigelow* of 1852; *Schott* of 1858; *Cous* of 1865; *Palmer* of 1869, 1870; *Engelmann* of 1880; *Pringle* of 1884): UTAH (*Parry* of 1874): SONORA (*Schott* of 1853): also specimens cultivated in the Mo. Bot. Gard. in 1881.

In all references to the fruit of this species it is described as "oval and green," except in Ives Report, where Dr. Engelmann describes its real character as the ordinary fruit of EUMAMILLARIA. The immature fruit is "oval and green," but with maturity it becomes clavate and scarlet. The Utah specimens of Parry show an exceptional character in their 30 to 33 scabrous radial spines, but otherwise they are quite normal. *M. microcarpa* Engelm., Emory's Rep. 156. f. 3, should be dropped as a synonym of this species, at least as to figure and description. In all probability *C. grahami* is one of the forms of the Mexican *C. schelhasii* (Pfeiff.). Except that in *C. grahami* the radial spines are apt to be more numerous and longer, and the centrals much darker; and in *C. schelhasii* the 3 centrals seem to be always present and sometimes all hooked, the descriptions suggest no difference. In the absence of authentic specimens of the latter species, however, and with its fruit and seed entirely unknown, such a reference of *C. grahami* must be deferred.

20. Cactus bocasanus (Poselger).

Mamillaria bocasana Poselger, Gart. Zeit. 94 (1853).

Depressed-globose, 2 to 3 cm. high: tubercles 8 mm. long, with long axillary wool: radial spines 25 to 30, white and capillary, 10 to 25 mm. long; central spines 2 to 4, slender and naked (or slightly puberulent), the most central one hooked (usually upwards), 15 to 25 mm. long, the upper 1 to 3 shorter and straight, all yellow with red tips, the hooked one often brownish-red nearly to the base: flowers unknown: fruit green, about 4 mm. long: seeds cinnamon-brown, oblique, broadly obovate, with narrowly ovate basal hilum.—Type unknown.

San Luis Potosi, so far as known. Poselger says, "Texas, auf der Seira de Bocas, among rocks," which station we have been unable to locate.

Specimens examined: SAN LUIS POTOSI (*Eschanzier* of 1891): also specimens cultivated in Hort. Pfersdorff in 1869; in Mo. Bot. Gard. in 1891; also growing in Mo. Bot. Gard. 1893.

The capillary radials give the plant a white-woolly appearance. The younger spines at the vertex are erect and tufted. It resembles *C. grahami*, but the tubercles are much more slender and not thickened at base, all the spines are more slender, the central hooked one is more reddish, and the fruit is much shorter.

21. Cactus eschanzieri, sp. nov.

Depressed-globose, 3 cm. in diameter, simple: tubercles broader at base, 6 to 8 mm. long, with naked axils: spines all pubescent; radials 15 to 20, with dusky tips, the lateral 10 to 12 mm. long, the lower weaker, shorter and curved, the upper shorter; solitary central spine reddish, slender, somewhat twisted, usually hooked upwards, 15 to 25 mm. long: flowers red (?): fruit reddish (?), ovate, about 10 mm. long: seeds reddish, oblique-obovate, 1.2 mm. long, pitted, with subventral hilum.—Type in Herb. Coulter.

San Luis Potosi.

Specimens examined: SAN LUIS POTOSI (*Eschanzier* of 1891).

Resembles *C. grahami*, but with fewer and more slender pubescent spines, longer and less rigid central, more exserted fruit, and much larger reddish and strongly pitted seeds with subventral hilum.

22. Cactus tetrancistrus (Engelm.).

Mamillaria tetrancistra Engelm. Am. Jour. Sci. II. xiv. 337 (1852), in part.
Mamillaria phellosperma Engelm. Syn. Cact. 262 (1856).
Cactus phellospermus Kuntze, Rev. Gen. Pl. 261 (1891).

Ovate or ovate-cylindrical, 5 to 25 cm. high, 3.5 to 7.5 cm. in diameter, simple or rarely branching at base: tubercles ovate-cylindrical, 8 to 14 mm. long, with axillary bristle-bearing wool, at length naked: radial spines 30 to 60, in two series, the exterior bristle-like, shorter and white, the interior stouter, longer and dusky-tipped or purplish; central spines 3 or 4, stouter, longer, brown or blackish from a paler base, the upper 2 or 3 (10 to 14 mm. long) straight, or one or two or even all hooked, the lower stouter and longer (12 to 18 mm.), hooked

upwards: flowers about 2.5 cm. long: fruit 1 to 2.5 cm. long: seeds large (1.2 to 1.5 mm. in diameter), globose and wrinkled, partly immersed in a brown spongy or corky cup-shaped 3-lobed appendage. (*Ill.* Cact. Mex. Bound. t. 7)—Type, Parry of 1850, but modified by Le Conte 14 and Bigelow of 1854, all in Herb. Mo. Bot. Gard.

Gravelly soil and sandy stream-banks, from the eastern slopes of the mountains of southern California, throughout western Arizona and southern Nevada to southern Utah; referred also to "N. W. Mexico" by Hemsley (Biol. Centr.-Amer.).

Specimens examined: CALIFORNIA (*Parry* of 1850; *Newberry* of 1858; *Parish* of 1882): ARIZONA (*Le Conte* 14; *Bigelow* of 1854; *Dr. Loew* of 1875): also *Palmer* of 1870, but with no locality.

In the original description this species was confounded with *C. grahami*, with which it grows and which it much resembles; and this, together with the fact that 4 central hooked spines are seldom found, induced Dr. Engelmann (Syn. Cact. 262) to propose the more appropriate but untenable name *M. phellosperma*. The resemblance to *C. grahami* is not so close as general appearance would indicate, as the more oblong or cylindrical form, longer and less crowded tubercles, more numerous spines, often more than one hooked central, large seeds, and remarkable seed-appendages serve well to distinguish it.

\+ + *Plants with fasciculate slender cylindrical stems (30 to 45 cm. high, and 2.5 to 6 cm. in diameter):* Lower Californian.

23. Cactus roseanus (Brandegee).

Mamillaria longihamata Engelm. Mss.

Mamillaria roseana Brandegee, Zoe, ii. 19 (1891).

Fasciculately branched at base, the stems 30 to 45 cm. long (sometimes pendent from rocks and as much as 200 cm. long) and 2.5 to 5 cm. in diameter, the whole plant glaucous: tubercles elongated-conical, ascending, 10 to 12 mm. long, with woolly axils: radial spines 7 to 10, straight, rigid and sharp, 9 to 15 mm. long, dark reddish when young, becoming ashy, the upper ones the longer; the solitary central much longer (20 to 30 mm.), almost black below and with reddish tip, becoming ashy with age, usually hooked downwards: flowers numerous, 2.5 to 3.5 cm. long, bright scarlet: fruit obovate to globose, scarlet, 6 to 9 mm. in diameter, fleshy: seeds black and pitted.—Type in Herb. Calif. Acad.

Apparently common at low elevations throughout southern Lower California, especially the eastern side.

Specimens examined: LOWER CALIFORNIA (*W. M. Gabb* 17 of 1867, near Loreto; *Brandegee* of 1889, at San Gregorio; *Palmer* 139 of 1890, near La Paz; *Palmer* 880 of 1890, on Carmen Island; *Brandegee* 241 of 1890, at Rancho Colorado).

One of the most showy species of Lower California. The plant has the appearance of a Coryphanth, and is remarkable for its tall and slender habit, its large central hooks, and its globose fruit. Since 1867 this species has been in Herb. Engelmann, fully characterized as above under the very appropriate specific name *longihamatus*.

24. Cactus setispinus, sp. nov.

Mamillaria setispina Engelm. **Mss.**

Fasciculate and ascending, simple or branched at base, the stems about 30 cm. high and 3 to 6 cm. in diameter, densely covered with remarkably long stout spines: tubercles short and broadly conical, with axillary wool: spines white, with black tips; radials 10 to 12, widely spreading, very unequal, 10 to 34 mm. long, slender and flexuous; central spines 1 to 4, more rigid and much longer (20 to 50 mm.), the upper ones straight, the lowest one longest and hooked (usually upwards) and often variously curved and twisted: fruit obovate and scarlet, 30 mm. long: seeds, black and pitted.—Type, Gabb 15 in Herb. Mo. Bot. Gard.

Rocky or gravelly soil, San Julio Canyon, and in the vicinity of San Borgia, Lower California.

Specimens examined: LOWER CALIFORNIA (*W. M. Gabb* 15 of 1867, at San Borgia; *Brandegee* of 1889, from San Borgia and San Julio Canyon).

In his notes Mr. Gabb describes the flower as "large, 3 to 3½ inches long, bell-shaped, of a beautiful purplish red color," concerning which Dr. Engelmann remarks "this would indicate a Coryphanth, but the tubercles show no trace of a groove, and, moreover, a withered remnant of a flower laterally attached (say 18 to 20 mm. long), so that I have no doubt that Mr. Gabb's statement is founded on some error." It is very probable that the flowers are scarlet and larger than Dr. Engelmann suggests. The species is closely allied to *C. roseanus*, but differs in its shorter tubercles and much longer spines. About a dozen stems rise in a clump, about a foot high, covering an area of 2 or 3 feet. These two species represent a very distinct Lower Californian group of cylindrical and hooked Eumamillarias. Both probably have showy scarlet flowers and may attain considerable length when growing upon rock ledges so as to become pendent. The specimens of *C. setispinus* from San Julio Canyon are from younger parts and show but a single long and hooked central. The San Borgia specimens show mostly 3 or 4 centrals, the lowest one hooked and becoming remarkably long and often variously twisted and curved. However, I can discover no difference except such as may be due to age.

* * * *Central spines present and not hooked.*

+ *Central spines more than one, longer than the radials, which are numerous, white and slender* (*capillary or bristle-like*) (*rigid in C. Halei*).

25. Cactus halei (Brandegee).

Mamillaria halei Brandegee, Proc. Calif. Acad. Sci. Ser. 2. ii. 161 (1889).

Stems cylindrical, 8 to 10 in a clump, about 30 cm. high and 5 to 7.5 cm. in diameter: tubercles short, with axillary wool: radial spines 10 to 22, rigid and erect-spreading, unequal, 6 to 15 mm. long; central spines numerous and erect-spreading, 1 to 3 of them very stout and prominent (25 to 35 mm. long); all the spines straight, at first reddish brown, becoming yellowish and ashy, more or less dark-tipped: flowers 2.5 cm. long, bright scarlet (almost throughout): fruit 12 mm. long, clavate and red: seeds black and pitted. (*Ill.* l. c. t. 6)—Type in Herb. Calif. Acad.

Abundant on Magdalena and Santa Margarita Islands, western coast of Lower California. Fl. January.

Specimens examined: LOWER CALIFORNIA (*Brandegee* of 1889, on Magdalena Island).

The tubercles are so close together that the plant appears thickly covered with the unusually stout and erect-spreading straight spines, a few of the centrals being specially prominent. The plant is more slender than the ordinary "cylindrical" members of the genus, but stouter than the slender hooked forms of the preceding section.

26. Cactus rhodanthus (Link & Otto) Kuntze, Rev. Gen. Pl. 261 (1891).
Mamillaria rhodantha Link & Otto, Icon. t. 26 (1828–31).
Mamillaria lanifera Haw. Phil. Mag. lxiii., 41 ( ), not Salm-Dyck (1850).

Oblong or subcylindric, 30 cm. or more high, 7.5 to 10 cm. in diameter, often forking from the middle: tubercles conical, 12 mm. long, 8 mm. in diameter, with woolly axils: radial spines 16 to 20, bristle-like, white, the lower longer (8 to 10 mm.); central spines 6 or 7, rigid, whitish with black tip, 12 mm. long: flowers rose color, 12 mm. in diameter: fruit 2.5 cm. long, cylindrical. (*Ill.* l. c.)—Type unknown.

Referred to Mexico in general, but reported as yet from San Luis Potosi to southern Mexico. Fl. profusely all summer.

Specimens examined: SAN LUIS POTOSI (*Bourgeau* 47; *Pringle* 3679; *Eschanzier* of 1891): also growing in Mo. Bot. Gard. 1893.

The specimens of Bourgeau and Pringle have somewhat larger spines than the type, as indicated by the description.

27. Cactus rhodanthus sulphureospinus.
Mamillaria sulphurea Forst. Handb. Cact. (1846), not *Cactus sulphureus* Gill. (1830).
Mamillaria rhodantha sulphurea Salm, Hort. Cact. Dyck. 11 (1850).

Central spines sulphur-yellow; otherwise like the species.—Type unknown.

San Luis Potosi.

Specimens examined: SAN LUIS POTOSI (*Pfeiffer*, with no number or date; *Eschanzier* of 1891).

The varietal distinction maintained seems a small one, but it is constant and striking, so far as can be discovered.

28. Cactus capillaris.
Mamillaria lanifera Salm, Cact. Hort. Dyck. 98 (1850), not Haw.
Cactus laniferus Kuntze, Rev. Gen. Pl. 250 (1891).

Cylindrical and erect: tubercles crowded, conical, glaucous, with axillary bristles: radial spines capillary and very numerous, white and crisped, entirely covering the plant; central spines 4 to 6, rigid, straight and spreading, straw-colored, 8 to 12 mm. long: flowers equaling the tubercles, the yellow petals striped with red: fruit unknown.—Type unknown.

Referred to Mexico in general, but definitely known only from Coahuila.

Specimens examined: COAHUILA (*Palmer* of 1880).

There is a confusion of synonymy between this species and *C. rhodanthus*, both having been named *Mamillaria lanifera*. The earlier *M. lanifera* of Haworth, how-

ever, is clearly *M. rhodantha* of Link & Otto; and although Prince Salm-Dyck revived the name for the present species, the law of homonyms will not permit it to stand. The name proposed refers to the abundant display of capillary radial spines, which is probably the most notable feature.

29. Cactus palmeri, sp. nov.

Cylindrical: tubercles crowded, glaucous, cylindrical (somewhat broadest above), about 4 mm. long, with dense axillary wool containing bristles: radial spines 25 to 30, very slender and white but rigid, about 5 mm. long, spreading or somewhat radiant, entangled with those of neighboring tubercles, and so covering the whole plant; central spines 3 to 5 (usually 4), more robust, erect or slightly divergent, brownish with darker tip, 7 to 8 mm. long: flowers small: fruit clavate and scarlet: seeds black and strongly pitted, 0.5 to 0.8 mm. in diameter.—Type, Palmer 921 in U. S. Nat. Herb.

San Benito Island, off the west coast of Lower California.

Specimens examined: LOWER CALIFORNIA, San Benito Island (*Palmer* 921 of 1889, reported as *Mamillaria Goodrichii*).

Very closely allied to *C. capillaris* of eastern Mexico.

30. Cactus stellatus Willd. Enum. Suppl. 30 (1813).

Cactus pusillus DC. Cat. Hort. Monsp. 184 (1813), not Haw. (1803).

Mamillaria pusilla DC. Prod. iii. 459 (1828).

A very common West Indian species, apparently differing from the variety only in the very much fewer (12 to 20) radial spines, although numerous specimens, both dried and living, were examined for additional characters. This difference, however, is so constant and striking that, taken together with the wide geographical separation, it should stand as varietal.

31. Cactus stellatus texanus (Engelm.).

Mamillaria pusilla texana Engelm. Syn. Cact. 216 (1856).

Mamillaria texana Young, Fl. Texas, 279 (1873).

Ovate-globose, 2.5 to 3 cm. in diameter, 2.5 to 6 cm. high, proliferous and at length cespitose: tubercles 7 to 9 mm. long, the long axillary wool intermixed with several coarse twisted bristles: radial spines very numerous, in many series, the outer ones (30 to 50) capillary, white, elongated and flexuous or crisped (12 to 16 mm. long when straightened), the inner ones (10 to 12) more rigid, shorter (6 to 8 mm.), puberulent, whitish or yellowish, usually dark-tipped; central spines 5 to 8, rigid, straight, pubescent, unequal, white below and reddish or dark above: flowers 1.5 to 2 cm. long, the yellowish-white petals with reddish median band: fruit 1.5 to 2 cm. long: seeds black and shining, conspicuously pitted, 1.2 mm. long. (*Ill.* Cact. Mex. Bound. t. 5.)—Type, Bigelow specimens in Herb. Mo. Bot. Gard.

From the mouth of the Rio Grande to El Paso, Tex., and southward into Coahuila and Chihuahua. Fl. March—May.

Specimens examined: TEXAS (*Bigelow* of 1853; *Neally* of 1892): COAHUILA (*Bigelow* of 1853): also growing in Mo. Bot. Gard. 1892 and 1893.

The exterior capillary spines cover the whole plant as with a coarse wool.

32. Cactus pringlei, sp. nov.

Globose (?), 5 cm. in diameter: tubercles short-conical, about 6 mm. long, with very woolly axils: radial spines 18 to 20, setaceous-bristly and radiant, 5 to 8 mm. long; central spines 5 to 7 (usually 6), stout and horny, more or less recurved, spreading, 20 to 25 mm. long; all straw-colored, but the centrals darker: flowers deep red (darker, even brownish, outside), 8 to 10 mm. long: fruit unknown.—Type, Pringle of 1891 in Herb. Gray.

San Luis Potosi.

Specimens examined: SAN LUIS POTOSI (*Pringle* of 1891).

Evidently a member of the *Chrysacantha* group and near *C. rhodanthus sulphureospinus*, but differs in the much shorter tubercles, straw-colored spines, shorter radials, much longer centrals, and smaller darker flowers.

33. Cactus sphærotrichus (Lem.) Kuntze, Rev. Gen. Pl. 261 (1891).

Mamillaria sphærotricha Lem. Cact. 33 (1839).

Depressed-globose: tubercles cylindrical, obtuse, with some axillary bristles: radial spines very much crowded, exceedingly numerous, radiant, very slender and bristle-like, white; central spines 6 to 10 and even more, erect and more rigid: flowers pale reddish: fruit unknown.—Type unknown.

Referred to Mexico in general, but reported only from San Luis Potosi.

Specimens examined: Mexican specimens from Hort. Dyck in 1857; from Hort. Pfersdorf in 1869; and growing in Mo. Bot. Gard. 1893 (from material sent by Pringle from San Luis Potosi).

++ *The single central spine shorter than the radials* (*in C. longimamma centrals often more than one and somewhat longer*).

34. Cactus gabbii, sp. nov.

Mamillaria gabbii Engelm MSS.

Globose, 5 to 10 cm. in diameter, simple: tubercles cylindrical, slender, 12 to 14 mm. long, with woolly axils: radial spines about 13, 5 to 8 mm. long, lower ones longer and stouter, especially the lateral ones pectinate; the central shorter, straight, and robust: flowers small, yellowish-red: fruit unknown.—Type in Herb. Mo. Bot. Gard.

Among rocks, from San Ignacio to Mission San Fernando, Lower California, and "perhaps farther north in the interior."

Specimens examined: LOWER CALIFORNIA (*W. M. Gabb* 19 of 1867).

35. Cactus sphæricus (Dietr.) Kuntze, Rev. Gen. Pl. 261 (1891).

Mamillaria sphærica Dietr. Allg. Gart. Zeit. xxi. 94 (1853).

Obovate or clavate, 5 cm. or more high, proliferous and at length densely cespitose: tubercles elongated-ovate, acutish, 12 to 16 mm.

long, with axillary wool: radial spines 12 to 14, setaceous, 7 to 9 mm. long, bulbous at base, straight or curved, white; central spine straight, subulate, somewhat shorter, but scarcely stouter: flowers yellow, 3.5 to 5 cm. long: fruit unknown.—Type unknown.

Sandy ridges in the valley of the Rio Grande (both sides of the river), from the mouth to Eagle Pass. Fl. from March throughout the season.

Specimens examined: TEXAS (*Schott* of 1852): also specimens cultivated in St. Louis in 1845 and 1861.

Dietrich's description was taken from plants collected by Poselger at Corpus Christi. The Schott specimens are from Eagle Pass. Dr. Engelmann calls attention to the fact that this species approaches CORYPHANTHA in its exserted ovary and large flower, but the flowers are clearly from the growth of the preceding season. The species is said to be too near the Mexican *C. longimamma* of central and southern Mexico, but in the absence of type specimens of either the question can not be settled. The usual characterization of *C. longimamma* is as follows, which seems to make it distinct enough:

36. Cactus longimamma (DC.) Kuntze, Rev. Gen. Pl. 260 (1891).
Mamillaria longimamma DC. Rev. Cact. 113 (1829).

Ovate or at length cylindrical, simple or cespitose: tubercles oblong-ovate, large at base, 4 to 5 cm. long: radial spines 7 or 8, radiant and equal, 8 to 10 mm. long or more, more or less pubescent; central spines 1 to 3, somewhat longer and spreading: flower 4 cm. long, becoming 6 cm. broad when fully expanded, yellow. (*Ill.* DC. Mem. Cact. t. 5.)

II. CORYPHANTHA. *Flowers from the base of a groove on young or nascent tubercles* (*hence appearing terminal*), *mostly large: spines never hooked* (*except in the doubtful C. brunneus*).

* *Flowers yellow.*

† *The originally central flowers pushed aside by the continuous development of new tubercles: usually a single prominent central spine.*

37. Cactus missouriensis (Sweet) Kuntze, Rev. Gen. Pl. 259 (1891).
Cactus mamillaris Nutt. Gen. i. 295 (1818), not Linn. (1753).
Mamillaria missouriensis Sweet, Hort. Brit. 171 (1827).
Mamillaria simplex Torr. & Gray, Fl. N. Am. i. 553 (1840).
Mamillaria nuttallii Engelm. Pl. Fendl. 49 (1849).
Mamillaria notesteinii Britton, Bull. Torr. Bot. Club, xviii, 367 (1891).

Globose, 3.5 cm. in diameter, simple or nearly so: tubercles ovate-cylindrical, 12 to 14 mm. long, slightly grooved: radial spines 13 to 17, straight, whitish, setaceous, somewhat unequal, 8 to 10 mm. long; central spine more robust, straight and porrect, puberulent, 10 to 12 mm. long, often wanting: flowers about 2.5 cm. long, yellow or reddish: stigmas 2 to 5: fruit globose, scarlet, 6 to 8 mm. in diameter: seeds globose, black and pitted, 0.8 to 1.1 mm. in diameter. (*Ill.* Cact. Mex. Bound. t. 74., f. 6, seeds.)—Type unknown.

High prairies of the Upper Missouri, from Montana to South Dakota and southward through western Nebraska to western Kansas and the eastern slopes of the mountains of Colorado. Fl. May.

Specimens examined: MONTANA (*Notestein* of 1893): NATIONAL PARK (*Tweedy* 423): SOUTH DAKOTA, (collectorun known, in 1847, 1848, 1853): NEBRASKA (*Hayden* of 1855).

38. Cactus missouriensis similis (Engelm.).
Mamillaria similis Engelm. Pl. Lindh. 246 (1845).
Mamillaria nuttallii cæspitosa Engelm. Syn. Cact. 265 (1856).
Mamillaria missouriensis cæspitosa Watson, Bibl. Index, 403 (1878).

Cespitose, with 12 to 15 puberulent radial spines, the central very often wanting, larger flowers (2.5 to 5 cm. long), fruit and seeds (1.6 to 2.2 mm. in diameter), and 5 stigmas. (*Ill.* Cact. Mex. Bound. t. 74. f. 7, seeds)—Type, Lindheimer, of 1845 (?) in Herb. Mo. Bot. Gard.

From the Kansas River, Kansas, and eastern Colorado, southward through Oklahoma to the San Antonio River, Texas.

Specimens examined: COLORADO (*Greene* of 1870): KANSAS (*Carleton* 551 of 1891, from Kingman County, distributed as *Mamillaria dasyacantha*): OKLAHOMA (*Carleton* 120 of 1891): TEXAS (*Lindheimer* of 1845, 1850; *Wright* of 1850; *Reverchon* 725): also specimens cultivated in Goebel's Garden in 1846; and in St. Louis in 1846, 1847, 1851.

The cespitose masses are often a foot broad.

39. Cactus missouriensis robustior (Engelm.).
Mamillaria similis robustior Engelm. Pl. Lindh. 200 (1850).
Mamillaria nuttallii robustior Engelm. and Bigel. Pacif. R. Rep. iv. 28 (1856).
Mamillaria missouriensis robustior Watson, Bibl. Index, 440 (1878).

Almost simple, with longer and looser tubercles, 10 to 12 stouter radial spines (6 to 16 mm. long), a single stout central, larger flowers, and 7 or 8 stigmas—Type, Lindheimer of 1845 in Herb. Mo. Bot. Gard.

From southeastern Colorado and the Canadian River (Oklahoma and Indian Territory), to the Colorado River of Texas.

Specimens examined: TEXAS (*Lindheimer* of 1845, 1846; *Bigelow* of 1853): also specimens cultivated in St. Louis in 1847.

In Bigelow's specimens the central spine is mostly lacking.

40. Cactus scheerii (Muhlenpf.) Kuntze, Rev. Gen. Pl. 261 (1891).
Mamillaria scheerii Muhlenpf. Allg. Gart. Zeit. xv. 97 (1847).
Mamillaria scheerii valida Engelm. Syn. Cact. 265 (1856).

Ovate-globose, 7.5 to 17.5 cm. high, 7.5 to 12.5 cm. in diameter, simple or sparingly proliferous at base: tubercles large (2.5 to 3.5 cm. long), from a broad base and suddenly contracted and almost cylindric (10 to 14 mm. in diameter), deeply grooved (1 to 5 orbicular glands in the groove), distant, spreading and ascending, the lower ones shorter, more conical and somewhat imbricated, with broad axils and the younger densely woolly: radial spines 6 to 16, straight or slightly curved, stout, rigid, bulbous at base, whitish or yellowish (sometimes reddish) with dark tip, the 2 to 5 lower and lateral ones stouter and compressed (18 to 30 mm. long), the 4 to 11 upper ones weaker and terete (10 to 20 mm. long); central spines 1 to 5, stout and angled, 20 to 36 mm. long,

mostly yellow (sometimes reddish), a single one very stout and porrect: flowers 5 cm. long, yellow (sometimes reddish tinged): fruit ovate or subglobose, green: seeds large (3 mm. long), flat and obovate, red.—Type unknown; that of the old var. *valida* is the Wright material in Herb. Mo. Bot. Gard.

Sandy ridges, southwestern Texas, from Eagle Pass and head of the Limpia to El Paso, and southward into Chihuahua, Coahuila, and San Luis Potosi; also southern Mexico (*fide* Hemsley). Fl. July.

Specimens examined: TEXAS (*Wright* 416, 478, of 1851, 1852; *Evans* of 1891): SAN LUIS POTOSI (*Eschanzier* of 1891).

The var. *valida* was described by Dr. Engelmann without having seen *C. scheerii*, the only knowledge of that species being obtained from the description of Prince Salm-Dyck in Cact. Hort. Dyck., which seemed to indicate a smaller form, with fewer spines than the Texan form. However, when visiting the collections of Prince Salm-Dyck, Dr. Engelmann found original specimens of *C. scheerii* which were exactly his var. *valida*. So far as collections show the Texan form seems to be more robust than the Mexican, but the material is too scanty to justify such a generalization. Dr. Engelmann speaks of this species as "a stately plant, by far the largest of the northern Mamillariæ." Its tubercles are bright green and in beautiful contrast with the showy yellow spines.

41. **Cactus robustispinus** (Schott) Kuntze, Rev. Gen. Pl. 261 (1891).
Mamillaria robustispina Schott in Engelm. Syn. Cact. 265 (1856).

A large stout plant, simple or cespitose: tubercles large, subterete, nearly 2.5 cm. long (and about the same distance from each other): radial spines 12 to 15, stout and rigid, 18 to 30 mm. long, the lower ones the stouter, more dusky, straight or often curved downwards, the upper straight and fascicled; the solitary central spine stout, compressed, curved downwards (occasionally an additional straighter upper one), not much longer than the radials, the base nearly 2 mm. wide; all the spines horny and black-tipped: flowers 3.5 to 5 cm. long, with very slender and constricted tube, saffron-yellow: fruit green: seeds large (3 to 3.2 mm. long and 2 mm. in diameter), obliquely obovate and curved, smooth and brownish. (*Ill.* Cact. Mex. Bound. t. 74. fig. 8, seeds)—Type, Schott specimens in Herb. Mo. Bot. Gard.

"On grassy prairies on the south side of the Babuquibari Mountains," Sonora. Fl. July.

Specimens examined: SONORA (*Schott* of 1853–4).

Dr. Engelmann remarks that the seeds of this species are larger than those of any other *Mamillaria* known to him.

42. **Cactus recurvatus** (Engelm.) Kuntze, Rev. Gen. Pl. 259 (1891).
Mamillaria recurvispina Engelm. Syn. Cact. 265 (1856), not Vries.
Mamillaria recurvata Engelm. Trans. St. Louis Acad. ii. 202 (1863).

Globose or depressed-globose, 7.5 to 20 cm. in diameter, simple: tubercles ovate, deeply grooved, crowded, somewhat imbricate, 10 to 12 mm. long: radial spines 12 to 20, bulbous at base, compressed, rigid, recurved or flexuous, 8 to 18 mm. long, whitish or horny, interwoven with adjacent clusters; central spine solitary (sometimes an additional

upper one), stouter and longer (12 to 20 mm.), dark, mostly strongly recurved and appressed (rarely straightish): flowers about 3.5 cm. long, yellow (brownish-tinged outside): fruit unknown.—Type, Schott specimens in Herb. Mo. Bot. Gard.

From Sonora to southern Mexico. Fl. June–August.

Specimens examined: SONORA (*Schott* of 1855).

43. Cactus salm-dyckianus (Scheer) Kuntze, Rev. Gen. Pl. 261 (1891).
Mamillaria salm-dyckiana Scheer in Salm, Cact. Hort. Dyck. 134 (1850).

Subglobose: tubercles very broad and retuse, almost 2-parted by the tomentose groove, with axillary floccose wool: radial spines 7 or 8, very rigid, widely radiant, somewhat curved, 3 to 3.5 cm. long, in older tubercles 3 to 6 additional slender and straight or twisted spines; the solitary central spine very stout, erect, almost 5 cm. long: flowers and fruit unknown.—Type: Scheer says that this plant, brought from Chihuahua by Potts, "unfortunately perished," and the description was drawn from fragments, which in those days were not apt to be preserved.

Chihuahua.

Specimens examined: CHIHUAHUA ("Salm of 1857").

The specimen referred to is in Herb. Mo. Bot. Gard., and reveals no additional characters; nor can the label be interpreted, except that it indicates that the specimen is from plants cultivated successfully in the gardens of Prince Salm-Dyck.

+ + Flower and fruit remaining central in the very woolly vertex of the plant.

++ Central spine solitary or wanting.

44. Cactus compactus (Engelm.) Kuntze, Rev. Gen. Pl. 260 (1891).
Mamillaria compacta Engelm. Wisliz. Rep. 21 (1848).

Depressed-globose, 5 to 10 cm. in diameter, simple: tubercles short-conical, crowded, 8 mm. long: radial spines 13 to 16, rigid, recurved and appressed, interwoven with adjacent clusters, whitish or horny, 10 to 20 mm. long; the erect central spine often wanting: flowers 3 to 3.5 cm. long and broad, yellow (brownish without): fruit oval, green: seeds 1.4 mm. long, smooth and yellow. (*Ill.* Cact. Mex. Bound. t. 74. fig. 2, seeds)—Type, Wislizenus of 1846 in Herb. Mo. Bot. Gard.

Mountains of Chihuahua. Fl. June–July.

Specimens examined: CHIHUAHUA (*Wislizenus* of 1846): also specimens cultivated in St. Louis in 1848, 1850, 1854.

45. Cactus radians (DC.) Kuntze, Rev. Gen. Pl. 261 (1891).
Mamillaria radians DC. Rev. Cact. 111 (1829).
Mamillaria pectinata Engelm. Syn. Cact. 266 (1856).

Globose, 3.5 to 7.5 cm. in diameter, simple: tubercles conical, from a 4-angled base, lower ones short (4 to 6 mm.), upper flower-bearing ones longer (10 to 12 mm.), terete and grooved: radial spines 16 to 24, somewhat recurved from a bulbous compressed base, stiff and pectinate, horny or whitish (at length ashy), interwoven with adjacent clusters, those on lower tubercles about equal (6 to 10 mm.), on flower-bearing

tubercles elongated, mixed with a few stouter ones and fasciculated (lower ones 10 to 12 mm. long, upper ones 12 to 18 mm. long and forming an apical tuft); centrals none: flowers over 5 cm. long and about 6 to 7.5 cm. in diameter when expanded, bright sulphur-yellow: fruit ovate and green, about 12 mm. long: seeds compressed, brownish, smooth and shining, 1.8 mm. long. (*Ill.* Cact. Mex. Bound. t. 11)—Type unknown; that of *M. pectinata* Engelm. is the Wright material in Herb. Mo. Bot. Gard.

Extending from the hills along the Lower Pecos to El Paso, southwestern Texas, southward through Coahuila and San Luis Potosi to southern Mexico.

Specimens examined: TEXAS (*Wright* 226 of 1849, also of 1852; *Evans* of 1891): COAHUILA (*Palmer* of 1880; *Mrs. Nickels*): SAN LUIS POTOSI (*Parry & Palmer* 265; *Eschanzier* of 1891): also specimens cultivated in St. Louis in 1853; in Mo. Bot. Gard. in 1892; and in Harv. Bot. Gard.

Even in the absence of the type I have ventured to refer *Mamillaria pectinata* Engelm. to this species. Dr. Engelmann had concluded that the two were "not sufficiently distinct," and the examination of Mexican forms which pass as *C. radians* abundantly confirms this conclusion. Besides, every character in the original description of *C. radians* applies exactly to these Mexican plants and to our Texan specimens as well. Aside from the fact that the Mexican specimens are apt to be more robust, I can discover no difference whatever. For discussion of relationships see under *C. scolymoides*.

46. Cactus radians pectenoides, var. nov.

Differs in its cespitose habit, fewer (16 or 17) and stouter spines (8 to 9 mm. long), and its larger and longer (10 mm.) less deeply grooved tubercles.—Type in Herb. Coulter.

San Luis Potosi.

Specimens examined: SAN LUIS POTOSI (*Eschanzier* of 1891).

47. Cactus corniferus (DC.) Kuntze, Rev. Gen. Pl. 260 (1891).
Mamillaria cornifera DC. Rev. Cact. 111 (1829).
Mamillaria impexicoma Lem. Hort. Monov. Cult. 5 (1839).
Mamillaria cornifera impexicoma Salm. Cact. Hort. Dyck. 20 (1850).

Globose, 7.5 cm. in diameter, simple: tubercles oblong-ovate, 2 cm. long, crowded, the younger axils woolly: radial spines 15 to 26, rigid and horny, curved or sometimes straight, reflexed, bulbous at base, yellowish (whiter with age) and with dark tips, very sharp, 10 to 12 mm. long; the central one much stouter, darker, slightly deflexed, 12 to 16 mm. long, sometimes wanting: flower unknown: fruit obovate, red, 2 cm. long: seeds reddish, angular, smooth, 2 mm. long.—Type unknown.

From San Luis Potosi to southern Mexico.

Specimens examined: SAN LUIS POTOSI (*Parry* of 1879; *Eschanzier* of 1891): also specimens cultivated in Mo. Bot. Gard. in 1892; growing in same garden in 1893.

Mamillaria impericoma Lem., afterwards reduced to a variety, was based upon fewer radial spines and no central. As the central is occasionally wanting in connection

with the most numerous radials, and present with the fewest, such a form would have to be separated solely on the absence of the central spine, and even in the original description of *impexicoma* the central spine is only said to be "sometimes wanting." It has been impossible for me to separate the forms. It should be said that the fruit and seed characters given above were taken from a specimen whose few radials and no centrals would undoubtedly refer it to *impexicoma*. As yet we are ignorant of the flower of *C. corniferus*. For discussion of relationships see under *C. scolymoides*.

++ ++ *Central spines 1 to 4.*

48. Cactus scolymoides (Scheidw.) Kuntze, Rev. Gen. Pl. 261 (1891).
Mamillaria scolymoides Scheidw. Allg. Gart. Zeit. ix. 44 (1841).

Globose or ovate, 5 to 7.5 cm. high, subsimple: tubercles conical, 10 to 16 mm. long, the upper elongated, incurved and imbricate: radial spines 14 to 20, straight or often recurved, white or horny, 10 to 20 mm. long (the upper the longer); central spines 1 to 4, longer (18 to 32 mm.), more dusky, curved, the upper ones turned upwards and intermixed with the radials, the lower one stouter, longer, and curved downwards: flowers 5 cm. long: fruit unknown.—Type unknown.

From the Pecos River, western Texas, westward into southern New Mexico, and southward into Chihuahua and San Luis Potosi.

Specimens examined: TEXAS (*Hays* of 1858): NEW MEXICO (*Bigelow* of 1853): CHIHUAHUA (*Wislizenus* of 1846): also specimens cultivated in St. Louis in 1858.

Specimens collected by Mrs. Anna B. Nickels across the Rio Grande from Laredo, Texas, and showing neither flower nor fruit, seem to intergrade between *C. scolymoides* and *C. scolymoides sulcatus*. The habit is that of the former, the tubercles are those of the latter, while the spines are somewhat different from either. The number of central spines in these specimens is very hard to determine, as on the adult tubercle they all assume a radial position. The usual adult arrangement is an apparent absence of central spines; 10 to 12 rigid, spreading and more or less recurved radials (increasing in length from the lowest), which are mostly white or the upper more or less dusky; and above, just behind the radial row, 2 or 3 stout recurved-ascending spines, which are white with tips more or less reddish-black, one of the spines usually much stouter and longer than the others. This form may represent a distinct species, but it seems very unsafe to add species to the *C. scolymoides* group without the fullest information.

Prince Salm-Dyck refers *C. scolymoides* to "M. daimonoceras Lem. Cact. gen. nov., p. 5," but no mention of such a name can be found in the work referred to. Labouret refers *C. corniferus* to the same name and reference. If "M. daimonoceras" was anything more than a garden or herbarium name used by Lemaire I have been unable to find it, and Dr. Engelmann's notes indicate that his search met with the same result. It is possible that the name was applied loosely to this assemblage of closely related forms that seem to cluster about *C. corniferus*.

A most perplexing question of relationship is presented by the forms that have been called *pectinatus, scolymoides, sulcatus* (*calcaratus*), *Echinus*, and the Mexican forms *radians, impexicomus*, and *corniferus*. It may be that they are all merely varieties of one strong polymorphic type, but our knowledge of *corniferus* is so incomplete, and material of other forms is so scanty, that I can not venture to make such an assertion. However, it seems probable that *radians, pectinatus, scolymoides, sulcatus*, and *Echinus* all have green fruit, while in *impexicomus* and *corniferus* it is red. It has also seemed proper to merge *radians* and *pectinatus*, also *impexicomus* and *corniferus*, and to refer *sulcatus* to *scolymoides* as a variety. These seven forms are thus reduced at least to four species.

49. Cactus scolymoides sulcatus (Engelm.).

Mamillaria sulcata Engelm. Pl. Lindh. 246 (1845), not Pfeiff. (1848).

Mamillaria strobiliformis Muhlenpf. Allg. Gart. Zeit. xvi. 19 (1818), not Scheer (1850).

Mamillaria calcarata Engelm. Pl. Lindh. 195 (1850).

Cactus calcaratus Kuntze, Rev. Gen. Pl. 259 (1891).

Differs in its smaller size, proliferous and much more cespitose habit, the dilated base of the more spreading tubercles, fewer (8 to 12) radial spines, usually a single central spine (wanting in young plants) and somewhat larger flowers. (*Ill.* Cact. Mex. Bound. t. 74. fig. 1, seeds) Type, Lindheimer of 1844 in Herb. Mo. Bot. Gard.

Texas, from the Brazos to the Nueces.

Specimens examined: TEXAS (*Lindheimer* of 1844; *Fendler* 34; *Wright* of 1850, 1854, 1857): also specimens cultivated in St. Louis in 1845, 1848, 1853, 1859.

This seems to represent the northeastern extension of the species, and doubtless it will be found merging into it south and west of the Nueces. Curiously enough, one of the prominent distinctions originally given was the single central spine, while in the type specimen there occur tubercles with more than one central.

50. Cactus echinus (Engelm.) Kuntze, Rev. Gen. Pl. 260 (1891).

Mamillaria echinus Engelm. Syn. Cact. 267 (1856).

Globose or subconical, 3.5 to 6.5 cm. in diameter, simple: tubercles terete, conical, grooved above, 10 to 12 mm. long: radial spines 16 to 30, pectinate, straight or little curved, rigid and appressed (interwoven with neighboring clusters), ashy-white (often dusky at apex), 8 to 12 mm. long, the uppermost longer (12 to 20 mm.); central spines 3 or 4, the upper ones turned upward and intermixed with the radials, the lower one very stout, 15 mm. long, subulate from a very thick bulbous base, straight (rarely slightly curved) and porrect (deciduous in old specimens): flowers 3 to 5 cm. long: fruit oval, elongated, about 2 cm. long, green: seeds elongated-obovate, brown and smooth, about 1.8 mm. long. (*Ill.* Cact. Mex. Bound. t. 10)—Type, the Wright and Bigelow specimens in Herb. Mo. Bot. Gard.

On limestone hills, from the Pecos River, southwestern Texas, and southern New Mexico, westward to the Rio Grande (from Presidio del Norte northward). Fl. June.

Specimens examined: TEXAS (*Wright* of 1849, 1851, 1852; *Bigelow* of 1852; *Engelmann*, with no number or date; *Evans* of 1891).

The characteristic appearance of the plant is given by the very stout and straight central spine standing in each cluster perpendicular to the plant body. The range of this species, between the Pecos and the upper Rio Grande, suggests another separated group, such as is presented by *C. scolymoides sulcatus* to the east, between the Brazos and Nueces. Very frequently specimens of *C. echinus* occur in which some of the tubercles do not develop central spines, and then the spine characters resemble those of *C. radians*. In *C. radians*, also, an occasional porrect central spine is found. These intergrading forms I have only seen in Mexican material. For discussion of relationships see under *C. scolymoides*.

* * *Flowers red.*

— *Central spine solitary or sometimes wanting.*

51. Cactus dasyacanthus (Engelm.) Kuntze, Rev. Gen. Pl. 259 (1891).
Mamillaria dasyacantha Engelm. Syn. Cact. 268 (1856).

Subglobose, 3.5 to 6.5 cm. high, simple: tubercles slender and terete, spreading, lightly grooved even to the base, 8 to 10 mm. long: radial spines 30 to 50, mostly in two series, straight and loosely spreading, the exterior ones (25 to 35) capillary and white, 6 to 18 mm. long, the interior ones (7 to 13) stiffer (setaceous), longer and darker and black-tipped; the central spine straight and porrect, 12 to 20 mm. long, often wanting: flowers small, red: fruit ovate, small (8 to 10 mm. long?): seeds globose-angled, almost black, pitted, 0.8 to 1·2 mm. long (*Ill.* Cact. Mex. Bound. t. 12. figs. 17–22)—Type, Wright 110 in Herb. Mo. Bot. Gard.

From Eagle Pass, Texas, westward to El Paso and southern New Mexico, and southward into Chihuahua.

Specimens examined: TEXAS (*Wright* 110 of 1852): NEW MEXICO (*Vasey* of 1881; *Mearns* of 1892, in Big Hatchet Mountains): CHIHUAHUA (*Pringle* 251 of 1885, in part).

Pringle 251 as distributed to Nat. Herb. is *C. tuberculosus*.

52. Cactus maculatus, sp. nov.

Obovate-cylindrical, 6 by 8 cm., somewhat cespitose: tubercles ovate, terete, 10 mm. long, grooved to the base, with naked axils: radial spines 10 or 11, straight and spreading, rigid, blackish (becoming ashy with age), black-tipped, 12 mm. long; central spine large, more or less spotted, erect, 25 to 35 mm. long: flower 13 mm. long, pinkish: fruit unknown.—Type in Herb. Coulter.

San Luis Potosi.

Specimens examined: SAN LUIS POTOSI (*Eschanzier* of 1891).

Somewhat resembles *C. tuberculosus* in general appearance, but very different in spine characters.

53. Cactus brunneus, sp. nov.

Obovate-cylindrical, 3 by 6 cm., simple: tubercles ovate, grooved to the base, 5 to 6 mm. long, with woolly axils: radial spines 11 to 15, spreading, rather rigid and brownish (lighter with age), 8 to 10 mm. long; central spine much larger, 20 mm. long, hooked: flower and fruit unknown.—Type in Herb. Coulter.

San Luis Potosi.

Specimens examined: SAN LUIS POTOSI (*Eschanzier* of 1891).

— — *Central spines 3 to 12.*

54. Cactus conoideus (DC.) Kuntze, Rev. Gen. Pl. 260 (1891).
Mamillaria conoidea DC. Rev. Cact. 112 (1829).
Mamillaria strobiliformis Engelm. Wisliz. Rep. 113 (1848), not Scheer (1850).

Ovate-conical, 3.5 to 10 cm. high, 4 to 7 cm. in diameter below, with densely woolly vertex, simple: tubercles conical, about 12 mm. long,

closely appressed-imbricate ("giving the plant the appearance of a pineapple or cone"): radial spines 10 to 16, ashy to white, straight and stout, 6 to 10 mm. long, the upper longer (10 to 15 mm.); central spines 3 to 5, stouter, brownish-black, 10 to 16 mm. long, the two or three smaller ones erect-spreading, the single lower one more rigid, porrect or deflexed, 15 to 20 mm. long: flowers 2 to 3 cm. long and wide, deep purple: fruit unknown. (*Ill.* DC. Mem. Cact. t. 2)—Type unknown.

On rocks, Coahuila and Nuevo Leon to San Luis Potosi and southern Mexico.

Specimens examined: COAHUILA (*Palmer* 378 of 1882; *Pringle* 3117 of 1890): NUEVO LEON (*Wislizenus* of 1847): SAN LUIS POTOSI (*Poselger* of 1851; *Eschanzier* of 1891).

55. Cactus potsii (Scheer) Kuntze, Rev. Gen. Pl. 261 (1891).
Mamillaria potsii Scheer in Salm Cact. Hort. Dyck. 104 (1850).

Cylindrical, 30 to 35 cm. high, 2.5 to 3 cm. in diameter, somewhat branching: tubercles ovate, obtuse, very lightly sulcate, with somewhat woolly axils: radial spines very numerous (entirely covering the whole plant), slender and white; central spines 6 to 12, stouter from a broad base: flowers large, green, or reddish: fruit red—Type unknown.

From the Rio Grande region, near Laredo, Texas, to Chihuahua.

Specimens examined: TEXAS (*Poselger* of 1851): CHIHUAHUA (specimens from Coll. Salm-Dyck.).

56. Cactus tuberculosus (Engelm.) Kuntze, Rev. Gen. Pl. 261 (1891).
Mamillaria strobiliformis Scheer in Salm Cact. Hort. Dyck. 104 (1850), not Muhlenpf. (1848), nor Engelm. (1848).
Mamillaria tuberculosa Engelm. Syn. Cact. 268 (1856).

Ovate to cylindrical, 5 to 15 cm. high, 2.5 to 5 cm. in diameter, simple or branching at base: tubercles short-ovate from a broad base, 5 to 6 mm. long, deeply grooved, crowded and imbricate, at length covering the older parts as naked and gray corky protuberances: radial spines 20 to 30, slender but stiff, white, radiant and interwoven with adjacent clusters, 4 to 8 mm. long (uppermost rarely 10 to 12 mm.); central spines 5 to 9, stouter, purplish above, the upper ones longer, erect, 10 to 14 mm. long (sometimes even 16 to 18 mm.), the lower one shorter (6 to 8 mm.), stout, porrect or deflexed: flowers about 2.5 cm. in diameter, pale purple: fruit oval, elongated (sometimes almost cylindric), red, about 18 mm. long: seeds subglobose, brown and pitted, very small (0.8 to 1.2 mm. long). (*Ill.* Cact. Mex. Bound. t. 12. figs.1–16)—Type of Scheer's *strobiliformis* is unknown; but the specimens of Prince Salm-Dyck in Herb. Mo. Bot. Gard. are marked "authentic" by Dr. Engelmann. The Wright specimens in the same Herb. represent the type of *M. tuberculosa* Engelm.

From the mountains of extreme southwestern Texas (common west of Devil's River), southward into Chihuahua and Coahuila. Fl. May–June.

Specimens examined: TEXAS (*Wright* 18, 19, 20, 23, 24, 29, 30, 31, 32, 535, of 1849 and 1852; *Bigelow* of 1852; *Engelmann*, with no number or date; *Evans* of 1891): CHIHUAHUA (*Pringle* 250, 251 in part, and 258 of 1885): COAHUILA (*Palmer* of 1880): also specimens from Coll. Salm-Dyck in 1857; also growing in Mo. Bot. Gard. 1893 (specimens sent by *G. G. Briggs* in 1892 from El Paso, Texas.

The identification of Engelmann's *tuberculosa* with Scheer's *strobiliformis* was made by Dr. Engelmann himself upon an examination of Scheer's type. The use of the specific name *tuberculosa* is necessitated by the law of homonyms, as *strobiliformis* had been used twice already before it was taken up by Scheer. *M. strobiliformis* Muhlenpf. is *C. scolymoides sulcatus;* and *M. strobiliformis* Englem. is *C. conoideus.*

57. Cactus viviparus Nutt. in Fraser's Cat. (1813).
Mamillaria vivipara Haw. Syn. Succ. Suppl. 72 (1819).

Low and depressed-globose, usually proliferous and cespitose (forming large masses), but sometimes simple: tubercles terete and loose, lightly grooved: radial spines 12 to 20, stiff and white, often dark-tipped, 6 to 8 mm. long; central spines usually 4 (sometimes less, often more, even as many as 8), brownish, 8 to 12 mm. long, 3 spreading upwards, the lowest stouter and shorter and deflexed: flowers about 3.5 cm. long (large for the size of the plant) and even broader when expanded, bright purple: stigmas pointed with a short mucro: fruit oval, pale green, juicy, 12 to 18 mm. long: seeds yellowish-brown, obliquely obovate and curved about the small hilum, 1.4 to 1.6 mm. long). (*Ill.* Cact. Mex. Bound. t. 74. fig. 3, seeds)—Type unknown.

On the northwestern plains, from the boundary provinces of British America (western Manitoba, Assiniboia and Alberta), and throughout the Upper Missouri region, southward through western Nebraska to western Kansas and to the eastern foothills of central Colorado. It is also mentioned by Howell (Cat. of Oregon, Washington and Idaho plants), as occurring beyond the Rocky Mountain divide in Idaho and Washington, which is probable, but no specimens have been seen.

Specimens examined: MONTANA (*Hayden*, nos. 1854, 1855; *Vernon Bailey* of 1890, near Bridger): COLORADO (*Hayden* of 1869): NEBRASKA (*Rydberg* 1379 of 1893, Thomas Co.): also specimens cultivated in St. Louis in 1869; also growing in Mo. Bot. Gard. 1893.

It seems best to keep this northwestern form specifically separate from that large assemblage of southern forms that have been commonly referred to it. The forms referred to this species from western Kansas (Smyth's check list) have not been examined, and they may represent intermediate forms, inclining to simple habit and ovate form, as in the Colorado forms. The southern type (*C. radiosus*) is distinguished from *C. viviparus* not only by its very different range, but also by its ovate to cylindrical form, simple habit, more numerous (12 to 40) and longer (6 to 22 mm.) radial spines, usually more numerous (3 to 14) central spines in which the upper are more robust than the lower, porrect lower central, obtuse stigmas, and brown obovate straight seeds.

58. Cactus radiosus (Engelm.).

Mamillaria vivipara Engelm. Pl. Fendl. 49 (1849), not Haw. (1819).
Mamillaria radiosa Engelm. Pl. Lindh. 196 (1850).
Mamillaria vivipara radiosa texana Engelm. Syn. Cact. 269 (1856).

Ovate or cylindrical, 5 to 12.5 cm. high and about 5 cm. in diameter, simple or sparingly proliferous: tubercles terete, more or less grooved above, 8 to 12 mm. long: radial spines 20 to 30, straight, slender, white with dusky apex, very unequal, 6 to 8 mm. long; central spines 4 or 5, stouter, yellowish or tawny, 8 to 12 mm. long, the upper ones the longer and more robust, the lowest one shorter and porrect: flowers 3.5 to 5.5 cm. long, about the same diameter when fully open, violet to dark purple: stigmas 7 to 9, obtuse: fruit oval and green: seeds yellowish or brown, obovate, pitted, fully 2 mm. long. (*Ill.* Cact. Mex. Bound. t. 74. fig. 5, seeds)—Type, Lindheimer of 1846 in Herb. Mo. Bot. Gard.

Extending across southern Texas, from the Guadalupe to El Paso, thence into contiguous New Mexico and across the Rio Grande near Juarez (northern Chihuahua). Fl. May–June.

Specimens examined: TEXAS (*Lindheimer* of 1846): NEW MEXICO (*Bigelow* of 1855): CHIHUAHUA, near Juarez (*Evans* of 1891): also specimens cultivated from the type in St. Louis in 1846.

Attention has been called under *C. viviparus* to the characters that distinguish it from *C. radiosus*. The characters there given for the latter species apply to the whole group of included forms. The type of the species is the var. *Texana* of Engelmann's Syn. Cact. and Mex. Bound., which is characterized in the above description.

59. Cactus radiosus neo-mexicanus (Engelm.).

Mamillaria vivipara radiosa neo-mexicana Engelm. Syn. Cact. 269 (1856).

Generally lower (3.5 to 10 cm.) and subglobose to ovate or even subcylindrical, branching at base or simple, with more numerous (12 to 40) radial spines, more numerous (3 to 12) and purplish centrals, and smaller seeds. (*Ill.* Cact. Mex. Bound. t. 74. fig. 4, seeds)—Type, presumably the Wright, Bigelow, and Schott specimens from western Texas, New Mexico, and Sonora, all in Herb. Mo. Bot. Gard.

From southern Utah, central Colorado, and western Kansas, southward through western Texas, New Mexico and Arizona into Chihuahua and Sonora.

Specimens examined: KANSAS (*Carleton* 530 of 1891, in Meade County): OKLAHOMA (*Carleton* 233 of 1891): COLORADO (*Hall and Harbour* of 1862; *Brandegee* 645 of 1873; *Hicks* of 1890): UTAH (*Siler* of 1870): NEW MEXICO (*Wislizenus* of 1846; *Fendler* 244, 271, of 1847; *Wright* 298; *Bigelow* of 1853; *G. R. Yasey* of 1881): TEXAS (*Wright* of 1849, 1851, 1852; *Bigelow* of 1853): ARIZONA (*Rothrock*, with no number or date): SONORA (*Schott* of 1855): CHIHUAHUA (*Evans* of 1891, near Juarez).

It is through this variety that *C. radiosus* approaches most nearly to *C. viviparus*, in the forms with few radials and centrals, but the specific characters seem to hold. This is the *Mamillaria vivipara* of the Syn. Fl. Colorado (Porter and Coulter).

60. Cactus radiosus arizonicus (Engelm.).

Mamillaria arizonica Engelm. Bot. Calif. i. 244 (1876).

A robust globose or ovate simple form (7.5 to 10 cm. in diameter), with long (12 to 25 mm.) deeply-grooved tubercles, 15 to 20 long (10 to 30 mm.) rigid whitish radial spines, and 3 to 6 centrals deep brown above.—Type, the specimens of Cous, Palmer, Bischoff, and Johnson, all in Herb. Mo. Bot. Gard.

Sandy and rocky soil from southern Utah through northern and western Arizona to southern California.

Specimens examined: ARIZONA (*Cous* of 1865; *Cous & Palmer* of 1865 and 1872; *Palmer* of 1869; *Bischoff* of 1871; *Miller* of 1881; *Rusby* 617 of 1883; *Pringle* of 1884): UTAH (*Johnson* of 1871, 1872, 1874; *Parry* of 1875, 1877): CALIFORNIA (*Parish* of 1880): also specimens cultivated in Mo. Bot. Gard. in 1881; and in Meehan's Gard. in 1882.

61. Cactus radiosus deserti (Engelm.).

Mamillaria deserti Engelm. Bot. Calif. ii. 449 (1880).

Subglobose or oval (5 to 10 cm. high) and simple, with deeply grooved tubercles (slender and about 12 mm. long), 25 to 30 rather long (10 to 16 mm.) grayish white radial spines (the larger with reddish tips), 3 or 4 shorter and stouter centrals with 5 or 6 intermediate ones above, small (2.5 cm. long) straw-colored flowers (becoming purplish-tipped), 5 or 6 stigmas, and obliquely obovate curved seeds.—Type, Parish 453 in Herb. Mo. Bot. Gard.

In the mountains bordering the deserts of southeastern California (San Bernardino County) and extending to central Nevada (Reese River Valley).

Specimens examined: CALIFORNIA (*Parish* 453 of 1880, also of 1882; *Bailey* of 1890): NEVADA, Lincoln County (*Coville & Funston* of 1891, Death Valley Expedition): also specimens cultivated in Meehan's Gard. in 1882.

The smaller straw-colored flowers alone suggest the propriety of keeping this form specifically distinct, but even in size and color there is an occasional tendency toward the specific character. The obliquely obovate curved seeds resemble those of *C. viviparus*. The plant densely covered with stout ashy-gray interlocking spines is easily recognized.

62. Cactus radiosus chloranthus (Engelm.).

Mamillaria chlorantha Engelm. Wheeler's Rep. 127 (1878).

Oval to cylindrical (7.5 cm. in diameter, sometimes 20 to 22.5 cm. high), with 20 to 25 gray radial spines almost in two series, 6 to 9 stouter reddish or brownish-tipped centrals (12 to 25 mm. long), and yellowish or greenish-yellow flowers 3.5 cm. long and wide.—Type: Southern Utah specimens of both Parry and Johnson occur in Herb. Mo. Bot. Gard., but they are all referred to *C. radiosus arizonicus*, and I can find no trace of any specimens of *C. radiosus chloranthus* in the Engelmann collection.

Southern Utah, east of St. George (*Parry; Johnson*).

The plant is evidently near *C. radiosus deserti*, of which variety it seems to be the Utah representative, but in the absence not only of the type, but even of authentic specimens, the two are kept separate, a thing fully justified by the description.

63. Cactus radiosus alversoni, var. nov.

Differs from var. *deserti* in its more robust and branching habit (becoming 12.5 cm. tall and 10 cm. in diameter), shorter and thicker tubercles, more numerous (12 to 14 centrals) stouter and longer (12 to 22 mm.) spines, all of which are black-tipped (the centrals black half way down, shading into red), and pink flowers.—Type, Alverson's specimens in Herb. Mo. Bot. Gard. and in Herb. Coulter.

In the desert region of extreme southeastern California.

Specimens examined: SOUTHERN CALIFORNIA (*A. H. Alverson* of 1892): also growing in Mo. Bot. Gard. 1893.

The covering of stout bushy interlocking spines is like that of var. *deserti*, but the black and reddish coloration gives a decidedly different appearance. On account of this appearance of a reddish-black brush the plant has been popularly called "fox-tail cactus." The decidedly pink flowers were sent by Mr. S. B. Parish from specimens growing in cultivation in San Diego, and are not from the original collection of Mr. Alverson.

64. Cactus macromeris (Engelm.) Kuntze, Rev. Gen. Pl. 260 (1891).
Mamillaria macromeris Engelm. Wisliz. Rep. 13 (1848).
Mamillaria heteromorpha Scheer in Salm. Cact. Hort. Dyck. 128 (1850).
Mamillaria dactylithele Labouret, Monogr. Cact. 146 (1858).

Ovate or cylindrical, 5 to 10 cm. high, simple or branching from the base and at length cespitose: tubercles large, loose and spreading, from a dilated base, more or less elongated (12 to 30 mm.) and teretish (often incurved), the groove absent in young plants and never reaching the axil: radial spines 10 to 17, slender and terete, or stouter and often angled, spreading, 12 to 40 mm. long, whitish (or more or less rose-colored when young), straight or a little curved; central spines 4 (or fewer in young plants or even wanting), spreading, 25 to 55 mm. long, stouter, bulbous at base, mostly black (the lowest the longest and stoutest), straight or sometimes curved or twisted: flowers 6 to 7.5 cm. long and of same diameter, deep red to purple: fruit ovate-subglobose, green, 15 to 25 mm. long: seeds globose-obovate, yellow, and smooth, 1.2 to 1.6 mm. long. (*Ill.* Cact. Mex. Bound. t. 14 and 15)—Type, Wislizenus of 1846 in Herb. Mo. Bot. Gard.

Mostly in loose sand, in the valley of the Rio Grande (on both sides of the river), from southern New Mexico to Eagle Pass, Texas, and doubtless further down.

Specimens examined: NEW MEXICO (*Wislizenus* of 1846; *Wright* 384, 531, of 1852; *G. R. Vasey* of 1881): TEXAS (*Wright* of 1850, 1851, 1852; *Bigelow* of 1852): CHIHUAHUA (*Evans* of 1891; *Budd* of 1891): also growing in Mo. Bot. Gard. 1893.

This species shows an interesting transition from CORYPHANTHA to *Echinocactus*. The woolly groove of the Coryphanths extends from the spine-bearing areola to the axil of the tubercle, where it expands into the flower-bearing areola. In *C. macro-*

meris the groove extends only about half way down the tubercle and gives origin to the flower-bearing areola on the side of the tubercle; while in *Echinocactus* the flower-bearing areola becomes adjacent to the spine-bearing areola and the flower appears at the summit of the tubercle.

ARTIFICIAL KEY TO THE SPECIES.

It seems impossible to make a simple artificial key that will serve as a useful guide to each individual species and variety. Our knowledge of so many of the species is imperfect, that no set of characters can be applied throughout. However, as no plants are collected in such fragmentary condition, it will be useful to construct a key based upon such characters as are always likely to be present, even if specific distinctions are not always reached. In many cases, species are so closely and differently related to each other that the complete descriptions will have to be consulted to determine the differences, and in such cases the artificial key can only indicate the group. Even the full descriptions are very compact, all characters not necessary for discrimination having been eliminated. No attempt need be made to determine any species by means of the flowers alone. In most cases more or less of the plant body will be available, presenting spine and tubercle characters, and these are used in the following key. The distinction between *Eumamillaria* and *Coryphantha*, on the basis of grooveless and grooved tubercles should always be made out easily. It may be useful to suggest as a caution, however, that often tubercles in drying develop folds which simulate grooves, and especially is this true in quadrangular tubercles. In such cases it is necessary to restore the original plumpness of the tubercle by boiling, before the presence or absence of the groove can be definitely determined. The species and varieties are indicated only by their specific or varietal names in the following key, and the numbers refer to the serial numbers of the synoptical presentation Forms occurring within the United States are italicized:

I. *Tubercles never grooved.*

**Central spines none.*

Radials 5 to 9, stout.
meiacanthus (7).
Radials 20 to 40.
micromeris (12), greggii (13).
Radials 40 to 80.
lasiacanthus (10), *denudatus* (11).

***Central spine solitary and not hooked.*

← *Central spine longer than the radials*

Radials 7 or 8: tubercles very long (40 to 50 mm.).
longimamma (36).
Radials 15 to 20: tubercles 6 to 8 mm. long.
eschanzieri (21).

+ + Central spine shorter than the radials.

Radials 5 to 9, stout.
meiacanthus (7).
Radials 9 to 22.
heyderi **(5),** *hemispharicus* (6), gummiferus (8), gabbii (34), *sphæricus* **(35).**

****Central spine solitary and hooked.*

+ Stems slender cylindric: Lower Californian.

Centrals 1, 20 to 30 mm. long.
roseanus (23).
Centrals 1 to 4, 20 to 50 mm. long.
setispinus (24).

+ + Stems depressed-globose to ovate.

Radials 4 to 6, rigid.
uncinatus (9).
Radials 8 to 12.
wrightii **(15).**
Radials 15 to 30.
grahami **(19), eschanzieri (21).**
Radials 50 to 60.
barbatus (18).

** * * * Central spines more than one, and none of them hooked.*

+ Slender or sometimes stout cylindrical plants, branching at base: Lower Californian.

brandegei (3), setispinus (24), halei (25).

+ + Depressed-globose to ovate and stout cylindrical.

++ Radials few (3 to 12) and rigid: Mexican.

Radials 3: centrals 3.
alternatus (1).
Radials 7 or 8: tubercles 40 to 50 mm. long.
longimamma (36).
Radials 10 to 12: tubercles 12 to 15 mm. long.
gummiferus (8).

+++ Radials numerous (16 to 60), capillary or bristle-like.

Radials 15 to 30, slender but rigid (bristly).
acanthophlegmus (2), densispinus (4), bispinus (14), rhodanthus (26), sulphureospinus (27), palmeri (29), pringlei (32).
Radials 30 to 60 or more, mostly capillary.
tetrancistrus **(22),** capillaris (28), ***texanus*** **(31),** sphærotrichus (33).

** * * * * Central spines more than one and but one of them hooked.*

Radials 10 to 15.
goodrichii **(16), setispinus (24).**
Radials 15 to 30.
pondii (17), *grahami* **(19), bocasanus (20).**
Radials 30 to 60.
tetrancistrus **(22).**

* * * * * * *Central spines more than one, and more than one of them hooked.*

Radials 8 to 12.
wrightii (15).
Radials 30 to 60.
tetrancistrus (22).

II. *Tubercles with a more or less prominent groove.*

* *Central spines none.*

+ *Radials whitish and rigid, appressed (pectinate) and interwoven with adjacent clusters.*

Depressed-globose and simple.
compactus (44).
Globose and simple.
radians (45), corniferus (47).
Cespitose.
pectenoides (46), *sulcatus* (49).

++ *Radials more slender and spreading.*

Radials 10 to 17.
missouriensis (37), *similis* (38), *macromeris* (64).
Radials 30 to 50, capillary.
dasyacanthus (51).

** *Central spine solitary, not hooked.*

+ *Central spine porrect.*

Radials 6 to 17.
missouriensis (37), *robustior* (39), *scheerit* (40).
Radials 30 to 50, white and capillary.
dasyacanthus (51).

++ *Central spine curved downwards.*

Radials 8 to 12.
sulcatus (49).
Radials 12 to 26.
robustispinus (41), recurvatus (42), corniferus (47), *scolymoides* (48).

+++ *Central spine erect: Mexican.*

Radials 7 or 8: central 50 mm. long.
salm-dyckianus (43).
Radials 10 or 11: central 25 to 35 mm. long.
maculatus (52).
Radials 13 to 16.
compactus (44).

*** *Central spine solitary and hooked.*

brunneus (53).

******** *Central spines more than one and none of them hooked.*

Centrals 2: radials 6 to 20.

scheerii (40), robustispinus (41), **recurvatus** (42), *scolymoides* (48).

Centrals 3: radials 6 to 40.

scheerii (40), *scolymoides* (48), ***echinus*** (50), conoideus (54), ***neo-mexicanus*** (59), ***arizonicus*** (60).

Centrals 4 or 5: radials 6 to 40.

scheerii (40), *scolymoides* (48), ***echinus*** (50), conoideus (54), *tuberculosus* (56), ***viviparus*** (57), *radiosus* (58), ***neo-mexicanus*** (59), *arizonicus* (60), *macromeris* (64).

Centrals 6 or 7: radials 12 to 40.

potsii (55), *tuberculosus* (56), ***viviparus*** (57), *neo-mexicanus* (59), *arizonicus* (60), ***chloranthus*** (62).

Centrals 8 to 14: radials 12 to 40 or more.

potsii (55), *tuberculosis* (56), ***viviparus*** (57), ***neo-mexicanus*** (59), *deserti* (61), ***chloranthus*** (62), *alversoni* (63).

GEOGRAPHICAL DISTRIBUTION.

It is only possible to deal with the forms that occur within the borders of the United States, as even individual stations of common Mexican forms are little if at all known. These United States forms represent a northern extension of an abundant Mexican display. The group EUMAMILLARIA, containing twelve of the thirty-one forms defined as occurring north of the Rio Grande, makes the feeblest extension northward, at no place being found far from the boundary, and all the twelve are Mexican forms which extend but slightly into the United States. Only five of the forms are found east of the Pecos: *heyderi*, the most widely distributed EUMAMILLARIA, extending from the southeastern border of Texas westward along the whole Mexican boundary except in California; *hemisphæricus*, extending through southern Texas and southern New Mexico; *meiacanthus*, also along the Mexican border of Texas and New Mexico; *texanus*, a low ground form of the Rio Grande Valley, extending from the mouth of the river to El Paso, and suggesting a connection with the West Indian *stellatus*; and *sphæricus*, another low ground valley form of similar range, but apparently only extending up the Rio Grande to the region of Eagle Pass.

The Pecos forms the eastern boundary of five other EUMAMILLARIA forms: *micromeris*, extending northward from Coahuila and Chihuahua, apparently only in the mountains between the Pecos and El Paso; ***wrightii***, of similar narrow northward extension, but ranging further northward on the high plains of the Upper Pecos in New Mexico; ***denudatus***, also with a narrow northward extension west of the Pecos; *lasiacanthus*, extending from Chihuahua with a northern limit between the Pecos and Arizona; and *grahami*, a Sonoran type which has spread between the Pecos and southeastern California.

The ten preceding forms have evidently entered our borders from the highlands of Sonora and Chihuahua, with the exception of the Rio Grande Valley forms, ***texanus*** and ***sphæricus***. Another species, ***tetrancistrus***, is also a Sonoran type which has reached the eastern slopes of

the mountains of southeastern California, and extended through western Arizona to southern Nevada and southern Utah, the most extended northern range of any EUMAMILLARIA. The twelfth form, *goodrichii*, is Lower Californian, and extends into California only in San Diego County. A summarized statement of the distribution of our twelve EUMAMILLARIÆ would be that two of them have extended from the low grounds of Coahuila and Chihuahua and spread along the valley of the Rio Grande; nine have come from the high grounds of Chihuahua and Sonora, four of which have extended eastward to the low levels of southeastern Texas; four have kept to the highlands west of the Pecos, and one has kept to the Colorado Valley and its tributaries, while one has a short northern extension from Lower California.

The nineteen forms of CORYPHANTHA are decidedly more northern in their distribution, and are our characteristic representatives of the genus *Cactus*. Ten of these, however, are but northern extensions of Mexican forms, and six of the ten have simply that tongue-like northern extension in the mountains between the Pecos and the Upper Rio Grande (above El Paso), viz.: *dasyacanthus*, *tuberculosus*, *scheerii* (which has also spread somewhat east of the Pecos), and the three pectinate and closely related forms *radians*, *echinus*, and *scolymoides*. Of the four remaining Mexican forms, *macromeris* is a low ground Rio Grande Valley form, extending from above El Paso well towards the Lower Rio Grande; *potsii* just crosses the border in the neighborhood of Laredo; and *radiosus* and *neo-mexicanus* have by far the greatest northern extension, stretching from Sonora and Chihuahua to southern Utah and central Colorado, and eastward to the Guadalupe River of Texas.

The nine remaining coryphanths are distinctly forms of the United States, occupying two well-marked regions, viz.: the northern plains, and the desert region of western Arizona and adjacent California, Nevada, and Utah. In the former region is found the widespread *viviparus*, which extends from the southern borders of British America to the plains of eastern Colorado and western Kansas, and even crosses the Rocky Mountain divide into northern Idaho and northeastern Washington; and *missouriensis*, which also ranges from the high prairies of the Upper Missouri to the same southern limit, and is continued southward into Texas in its varieties *similis* and *robustior*.

In the Arizona desert region, four distinct but closely allied forms have become differentiated from the strong *radiosus* stock, viz.: *arizonicus*, *deserti*, *alversoni*, and *chloranthus*, all of which might be regarded as distinct species. In southeastern Texas is found an isolated form, *sulcatus*, occuring between the Brazos and Nueces rivers. That *viviparus* must be regarded as a strong northern extension of the *radiosus* stock can not be doubted, as the low depressed cespitose northern form seems to merge southward so gradually into the simple more robust ovate to cylindrical forms of *radiosus* as to suggest the propriety of regarding them all as specifically identical.

The result of a closer inspection of the distribution of these nearly related forms is worthy of note. *O. viviparus* extends from British America and the Upper Missouri to eastern Colorado and western Kansas; *neo-mexicanus* (the form most nearly related to *viviparus*) extends from central Colorado and southern Utah into Mexico; at the southeastern edge of this range begins *radiosus* and extends eastward through southern Texas; from the western edge of *neo-mexicanus* the form *arizonicus* extends westward into southern California, touching *chloranthus* at its Utah limit, and at its California extension reaching *alversoni* and *deserti*, the latter of which extends northward into the desert region of southeastern California and adjacent Nevada. Taking this type as of Mexican origin, it seems to have entered the United States from Sonora and Chihuahua, and to have spread in three directions, viz.: eastward through southern Texas; westward and northwestward into southern California and southern Utah; and northward to the head waters of the Missouri and British America, though we would limit the northern extension of the present specific type to central Colorado, and would regard the still more northern forms as of the same origin but entitled to specific rank.

2. **ANHALONIUM** Lem. Cact. Gen. Nov. (1839).

Depressed or flattened, simple, unarmed plants, covered with peculiar imbricated tubercles above and their scale-like remains below: tubercle with lower and upper parts very different; lower part comparatively thin and flat; upper exposed part triangular in outline and divergent, very thick and hard, the lower surface smooth and keeled, the upper surface plane or convex, smooth or tuberculate or variously fissured, with a broad wool-bearing groove or simply a more or less evident tomentulose apical areola: spine-bearing areolæ obsolete: flower-bearing areola at the summit of the lower peduncle-like portion of the very young tubercle (thus appearing axillary with reference to the exposed part of the tubercle) and bearing a dense penicellate tuft of long soft hairs which conceals the lower part of the flower and the entire fruit and persists about the apical region of the plant as matted and apparently axillary wool: ovary naked: seeds large, black, and tuberculate: embryo obovate, straight.

According to the present views concerning generic limitations in *Cactaceæ*, *Anhalonium* must certainly be kept distinct from *Mamillaria*, and to such a view Dr. Engelmann had finally come. The generic distinction is based upon such characters as (1) the complete suppression of the spine-bearing areolæ; (2) the strong differentiation of the tubercles into two very distinct regions; (3) the production of the flower at the apex of the basal or penduncle-like portion (which becomes flattened and expanded at maturity) of a very young tubercle; and (4) the large tuberculate seeds.

In the case of *engelmanni* the broad woolly groove of the upper portion of the tubercle expands below into the flower-bearing areola, but terminates blindly above just behind the sharp apex. In *prismaticum* and *furfuraceum* the groove is obliterated, but there usually remains a small (more or less tufted) areola and depression

just behind the apex to mark its upper extremity. This apical areola, therefore, does not represent a spine-bearing areola, but the closed upper extremity of a tubercle groove.

It seems evident that *Anhalonium* is a much modified *Cactus*, and that its affinity is with the coryphauths, through such a species as *C. macromeris*, in which the flower becomes extra-axillary. If in *macromeris*, with the flower standing well up on the tubercle, the portions of the tubercle above and below the flower should become very different from each other, the upper portion being so much modified as to cause the spine-bearing areola to be obliterated, the condition of things in *Anhalonium* would be obtained.

* *Upper surface of tubercle with a broad and deep wool-bearing longitudinal groove which widens below.*

1. **Anhalonium engelmanni** Lem. Cact. 42 (1839).
   Mamillaria fissurata Engelm. Syn. Cact. 270 (1856).
   Anhalonium fissuratum Engelm. Bot. Mex. Bound. 75 (1859).

Depressed-globose or flat, top-shaped below and tapering into a thick root, 5 to 12 cm. in diameter: tubercles (upper portion) appressed-imbricate, 12 to 18 mm. long and about as wide at base, the upper surface convex and variously fissured (presenting an irregular warty appearance) even to the edges: flowers apparently central, about 2.5 cm. long and broad, shading from whitish to rose: fruit oval, pale green, about 10 mm. long: seeds 1.6 mm. long. (*Ill.* Bot. Mex. Bound. t. 16)—Type unknown; but specimens of Wright, Bigelow, and Parry in Herb. Mo. Bot. Gard. are the basis of Engelmann's *Mamillaria fissurata*.

On limestone hills, in the "Great Bend" region of the Rio Grande in Texas, and southward into Coahuila. Fl. September–October.

Specimens examined: TEXAS (*Wright* of 1850; *Bigelow* of 1852; *Parry*, with no number or date; *Lloyd* of 1890; *Evans* of 1891; *Briggs* of 1892): also growing in Mo. Bot. Gard. 1893.

This species is very closely related to the Mexican *A. kotchubeyi* Lem. (*A. sulcatum* Salm-Dyck), but unfortunately no type of that species seems to be in existence, and Dr. Engelmann notes (Mex. Bound. Rep. 75) that "it seems no living or dead specimen is at present extant in Europe." Judging from the description, the upper surface of the tubercles in *A. kotchubeyi*, aside from the central furrow, is smooth; at least the margin is "very entire."

* * *Upper surface of tubercle not grooved, but usually with a tomentose pulvillus at the tip.*

2. **Anhalonium prismaticum** Lem. Cact. 1 (1839).
   Mamillaria prismatica Lem. Hort. Univ. i. 231 (1839).
   Cactus prismaticus Kuntze, Rev. Gen. Pl. 261 (1891).

Flat above, top-shaped below, 7.5 to 12.5 cm. in diameter: tubercles (upper portion) closely imbricate but squarrose-spreading, sharply triangular-pyramidal and very acute (with a sharp cartilaginous tip, which usually disappears with age and leaves the older tubercles blunt or retuse), 18 to 25 mm. long and about as wide at base, the upper surface almost plane and smooth, except that it is more or less

pulverulent and usually bears a small tomentose pulvillus (often evanescent later) just behind the claw-like tip: flowers rose-color: fruit elongated-oval and reddish. (*Ill.* Lem. Cact. t. 1.)—Type unknown.

Referred to Mexico in general, but reported definitely only from San Luis Potosi. Undoubtedly found in Coahuila, and possibly crosses the Rio Grande in the region of the "Great Bend."

Specimens examined: SAN LUIS POTOSI (*Eschanzier* of 1891): MEXICO in general (specimens from Coll. Salm-Dyck in 1858; *Schott* of 1858): also specimens cultivated in Mo. Bot. Gard. in 1881; also growing in same garden in 1893.

3. Anhalonium furfuraceum (Watson).

Mamillaria furfuracea Watson, Proc. Amer. Acad. XXV. 150 (1890).

Very closely related to *prismaticum;* but triangular portion of tubercle acuminate and shorter, having an irregularly mamillate upper surface, and the acumination ending abruptly in a cartilaginous depression containing a tomentose pulvillus: flowers 2.5 to 3 cm. long, white or pinkish, the sepals brownish.—Type, Pringle 2580 in Gray Herb.

At Carneros Pass, Coahuila.

Specimens examined: COAHUILA (*Pringle* 2580 of 1889).

The type of this species was not among the collections received from Cambridge, but a specimen of the same distribution from the National Herbarium shows tubercle dimensions different from those recorded in Dr. Watson's description. In that description the triangular terminal surface is said to be "about an inch broad by one-half inch," which is decidedly different from the equilateral surface of the tubercle of *prismaticum.* In the National Herbarium specimen of *furfuraceum*, however, of the same distribution, the surface is almost equilateral, measuring 15 mm. long by 18 mm. wide at base. Without the acuminate upper portion the breadth of the triangular portion would be about double its length. The lower rim of the cup-like depression which terminates the turbercle and contains the pulvillus is sometimes slightly prolonged into a tooth, which in *prismaticum* becomes the sharp tip of the tubercle. The "minutely furfuraceous-punctulate" character of the tubercle is common to all the species of *Anhalonium* I have seen, and simply represents the external openings of the remarkably long cuticular passageways to the stomata.

4. Anhalonium pulvilligerum Lem. Cact. (1839).

Anhalonium elongatum Salm-Dyck (1850).

This seems to be a third grooveless Mexican species. I have seen no specimens, but judge from the description that it differs from the two preceding species chiefly in its less crowded and more elongated tubercles (triangular portion 5 cm. long by 2.5 cm. broad at base), which are covered at apex with a tomentose pulvillus.

GEOGRAPHICAL DISTRIBUTION.

This curious genus is strictly Mexican, and, so far as at present recorded, is characteristic of Coahuila, but a single species (*engelmanni*) of the four or five known crossing the Rio Grande in the Great Bend.

3. LOPHOPHORA, gen. nov.

Depressed-globose, proliferous and cespitose, tuberculate-ribbed, unarmed plants: tubercles at first conical and bearing at summit a flower-bearing areola with a dense tuft or short pencil of compact erect hairs, when mature becoming broad and rounded (with the remnant of the penicellate tuft as a persistent pulvillus in a small central depression) and coalescing into broad convex vertical ribs: spine-bearing areolæ obsolete: flowers borne at the summit of nascent tubercles: ovary naked (that is free from scales, but often downy): fruit and seed unknown.

These forms have been variously referred to *Anhalonium* and *Echinocactus*, but seem to deserve generic distinction. They differ from *Anhalonium* in the entire suppression of the upper highly differentiated portion of the tubercle, in the broad and rounded development of the lower portion, and in the coalescence of the enlarged tubercles into broad vertical ribs. In fact, in young specimens, the plant appears almost smooth, with shallow furrows radiating from the depressed apex. The genus differs from *Echinocactus* in the suppression of the spine-bearing areolæ, and the naked ovary. In the examination of developing tubercles the relation to *Anhalonium* is evident. In the latter genus the young tubercle bears on the summit of its pedicel-like lower portion the tufted flower-bearing areola, the modified upper portion of the tubercle at that time appearing as a bract beneath the flower. In *Lophophora* there is the same condition of things, except that the bract-like upper portion is wanting. From this point of view it would appear that the differences between *Lophophora* and *Echinocactus* are intensified by the fact that the flower-bearing areola in the former genus is to be regarded as really lateral on a tubercle the upper part of which has disappeared. This genus occurs abundantly in southeastern Texas, extending southward into Mexico. Mrs. A. B. Nickels reports that the Indians use the plants in manufacturing an intoxicating drink, also for "breaking fevers," and that the tops cut off and dried are called "mescal buttons."

1. Lophophora williamsii (Lem.).

Echinocactus williamsii Lem. Allg. Gart. Zeit. XIII. 385 (1845).

Anhalonium williamsii Lem. in Forst. Handb. Cact. i. 233 (1846).

Hemispherical, from a very thick root, often densely proliferous, transversely lined below by the remains of withered tubercles: ribs usually 8 (in young specimens often 6), very broad, gradually merging above into the distinct nascent tubercles which are crowned with somewhat delicate penicillate tufts, which become rather inconspicuous pulvilli on the ribs: flowers small, whitish to rose: stigmas 4. (*Ill.* Bot. Mag. t. 4296)—Type unknown.

Along the Lower Rio Grande, Texas, and extending southward into San Luis Potosi and southern Mexico.

Specimens examined: TEXAS (*Mrs. Nickels* of 1892): SAN LUIS POTOSI (*Eschanzier* of 1891): also growing in Mo. Bot. Gard. 1893.

2. Lophophora williamsii lewinii (Hennings).

Anhalonium lewinii Hennings, Gartenflora, 410 (1888).

A much more robust form, with more numerous (usually 13) and hence narrower and more sinuous ribs, and much more prominent tufts. (*Ill.* Monats. Kakteenkunde, October, 1891)—Type unknown.

Along both sides of the Lower Rio Grande.

Specimens examined: TEXAS (*Wm. Lloyd* of 1890, mouth of the Pecos; *Mrs. Nickels* of 1892, 1893): MEXICO (specimen collected across the Rio Grande, near Laredo, in 1894): also growing in Mo. Bot. Gard., 1893.

The extreme specific and varietal forms seem worthy of specific distinction, but abundant growing material in Mo. Bot. Gard. showed such complete intergradation that a specific line of separation was found to be impossible. The varietal form is said to be an important one in the ceremonial rites of the Indians.

GEOGRAPHICAL DISTRIBUTION.

These forms are evidently Mexican in origin, and the specimens seen are all from the Rio Grande region. They have crossed that river below the "Great Bend," and probably belong to lower-lying, more eastern Mexican provinces than do the species of *Anhalonium*. *L. williamsii* is reported from southern Mexico, but so little is known of the distribution of these plants that their eastern Mexican range is conjectural.

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[Synonyms are printed in italics.]

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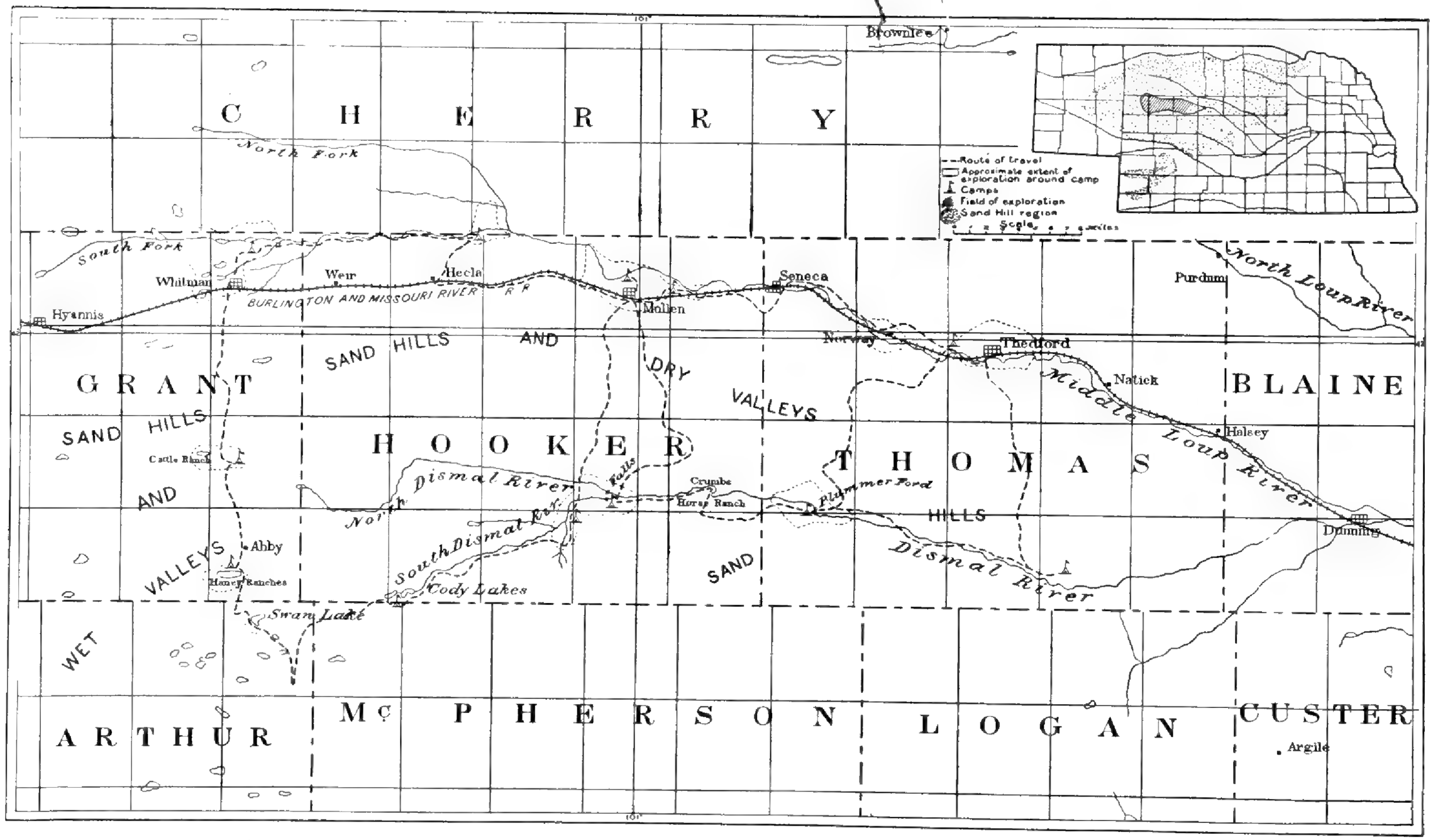

PART OF THE SAND-HILL REGION OF NEBRASKA, ILLUSTRATING THE ROUTE OF P. A. RYDBERG IN 1893.

PLATE I.

U. S. DEPARTMENT OF AGRICULTURE.
DIVISION OF BOTANY.

CONTRIBUTIONS

FROM

THE U. S. NATIONAL HERBARIUM.

Vol. III, No. 3.

ISSUED SEPTEMBER 14, 1895.

FLORA OF THE SAND HILLS OF NEBRASKA.

BY

P. A. RYDBERG.

WASHINGTON:
GOVERNMENT PRINTING OFFICE.
1895.

LETTER OF TRANSMITTAL.

UNITED STATES DEPARTMENT OF AGRICULTURE,
DIVISION OF BOTANY,
Washington, D. C., May 3, 1895.

SIR: I have the honor to transmit herewith, for publication as Volume III, No. 3, of Contributions from the United States National Herbarium, a report entitled "Flora of the Sand Hills of Nebraska," by Mr. P. A. Rydberg. In the year 1893 a change was made in the plan of the field work of the Division of Botany, according to which each field agent, or assistant detailed for field work, would make a comprehensive report on the flora of the particular region assigned to him, including not merely a catalogue of the plants of that region, but also a report on the general differences of its minor floras, and their relation to climatic and other conditions, on its native plant resources, and on the success or failure of the agricultural beginnings already made. In the present instance Mr. Rydberg was instructed to cover primarily the following subjects: (1) A collection of all the species of plants in the region traversed; (2) observations on the uses of native plant products; (3) observations on temperature, humidity, wind, and rainfall; (4) information on native commercial plant resources; (5) an enumeration of all plants cultivated in the region. Working under detailed instructions on each of these subjects, Mr. Rydberg has presented the accompanying report, which it is hoped will give a sufficiently clear idea of the characteristics of the natural vegetation of the region to be valuable as a guide to those interested in improving commercially and agriculturally this area, half barren but undoubtedly to some extent utilizable.

Respectfully,

FREDERICK V. COVILLE,
Botanist.

Hon. J. STERLING MORTON,
Secretary of Agriculture.

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FLORA OF THE SAND HILLS OF NEBRASKA.

By P. A. Rydberg.

INTRODUCTORY NOTE.

May 23, 1893, the writer was appointed field agent of the Division of Botany in the United States Department of Agriculture for the purpose of making a botanical exploration and collection in the sand hill region of Nebraska. On the recommendation of Dr. Charles E. Bessey, of the University of Nebraska, Thomas and Hooker counties were selected as the principal field of exploration. The former county lies nearly in the center of the region, and affords perhaps the best representation of the central sand-hill flora.

The sand-hill region extends from 98° to 103° west longitude, and is bounded on the southwest by the North Platte River, and on the north by the Niobrara River. The southeastern limit is a broken line from a point near the mouth of the Niobrara to Dawson County. In pursuance of my instructions from the Department to confine my work to an area sufficiently restricted to admit of thorough examination, the field of exploration was practically limited to the two counties mentioned above and one-third of Grant County. On two occasions I crossed over into Cherry County and once into Arthur and McPherson counties.

ITINERARY.

I left Lincoln by the Burlington and Missouri River Railroad in company with Mr. N. P. Tulen, a student of Augustana College, Rock Island, Ill. Mr. Tulen stayed with me until August 25, and to him many thanks are due for his hearty coöperation.

Our first station was at Thedford, the county seat of Thomas County, which was to serve as our base of operations. Here we remained till June 24, by which time we had secured a team and outfit for the summer. During our stay I met Mr. C. C. Wright, one of the early settlers, who has several times sent collections of grasses to the Nebraska State fairs. From him much useful information was obtained, and specimens were received of a few grasses which I did not collect myself.

June 20 we collected around Natick, a flag station 7 miles east of Thedford, and on the 22d and 23d around Norway, a station 8 miles west of the same place. All these stations are situated in the Middle Loup Valley, which the Burlington and Missouri River Railroad follows from Dunning, Blaine County, to a point 5 miles east of Mullen, Hooker County. During the nine days of collecting we secured a nearly complete representation of the flora of this valley as well as of the surrounding sand hills.

June 24 we drove across the sand hills to Dismal River, 15 miles south of Thedford, in our two-horse spring wagon, our outfit consisting of a small A tent, 7 by 7 feet, two collecting cases, six presses with driers and specimen sheets, and the necessary bedding, clothing, provisions, and cooking utensils. The presses, which were found well adapted to our field work, were made of heavy wire netting supported by a stout frame of hard wood, with two crossbars. The parts are drawn together by means of strings, somewhat as in the Acme press of the trade. These presses have the advantage over board presses that they give free access of air to the driers and thus materially facilitate the drying, while at the same time the pressure may be regulated at pleasure.

Our first camp was pitched on the top of the sand hills, about half a mile from the river, a few miles below the point at which we first reached it. We remained here till the 30th of June, when we moved 10 or 12 miles up the stream to a place known as Plummer Ford. Here we stayed till July 10, enjoying the best collecting found anywhere during the summer. As there were no settlers in the neighborhood we were obliged to visit Thedford once a week to replenish our food supply, which incidentally afforded a good opportunity to study the sand hills.

July 10 we moved our camp to a place near the "forks" of the Dismal River, collecting there until July 15. Then we crossed the sand hills at a third point, and returning to the Middle Loup Valley, pitched our camp near the river, 1½ miles north of Mullen, the county seat of Hooker County.

On the 25th we again broke camp, and as there was no road along the river we drove to Mullen, and thence followed the dry valley through which the Burlington and Missouri River Railroad passes to Hecla, a flag station about 8 miles west of Mullen. Here we turned northward and struck the south branch, or as it is called here, "south prong," of the Middle Loup, a few miles above the junction, and a mile or two over the Cherry County line.

July 28 we broke camp again and followed up the south prong. The river, which was here only a small brook, soon disappeared from the surface, and was succeeded by a sand draw running through a valley, the grass of which became better and better as we proceeded. At the head of this draw we found a valley having in its eastern end a lake, at this time of the year only a small pool filled with *Batrachium divaricatum*. Here we pitched our camp near Mr. Taylor's ranch, about 3 miles northeast of Whitman.

In this locality we collected until August 2, when we drove south, passing through Whitman. Along the road there were no settlers and no springs, but 15 miles south of Whitman, near a windmill erected for the purpose of watering cattle, we found a suitable camping place. During this and the following nights a heavy dew fell, a phenomenon not observed again during the summer. The thermometer was only 57° F. at 9 o'clock the next morning.

In the morning of August 4 we moved camp again, following the post-road to a point about a mile south of Abby post-office. Here was a big wet valley, containing four ranches.

August 7 we set out for the head waters of the south fork of Dismal River, and at noon stopped near Swan Lake, collecting there for a few hours. Late in the evening we arrived at West Cody Lake, situated on a cattle range once occupied by Mr. W. F. Cody, better known as "Buffalo Bill." The Cody lakes are the head waters of South Dismal River, although the water runs beneath the surface of the sand for 2 or 3 miles before it forms a visible stream. The region around the lakes was a good collecting ground.

August 11 we moved our camp farther down the river to a place about 4 or 5 miles above the forks. August 15 we crossed the sand hills again to Mullen, when we drove down the Middle Loup Valley to Thedford. August 21 to 25 we made a collecting trip to Plummer Ford to get the fall flora of Dismal River.

I was absent from official duty from August 26 to September 6, but beginning work again I confined myself to the region along the Burlington and Missouri River Railroad, collecting around Thedford September 7 to 10 and 12 and 13. Halsey and Natick September 11, Mullen September 14, 15, and 18, Seneca September 16, and Whitman September 19 and 20.

FORMATION OF THE SAND-HILL REGION.

Even if the sand-hill region was at some earlier period a lake formation, it has, nevertheless, received its present form from the action of the wind—in fact it is still in the process of formation. The sand hills change their configuration constantly. Whenever the sand is not held together by the roots of plants or by moisture, or is not otherwise protected, it is little by little carried away by the wind. If a spot on a dry hill becomes bare the loose sand is blown away, a small hollow is made, the surrounding grass dies from drought, the dry sand, no longer held together by the roots, slides down into the hollow and in its turn is borne away, and thus the hollow becomes gradually larger and larger. Such "blowouts" were seen 100 meters in diameter and 15 to 20 meters deep. It sometimes happens that settlers a few years after breaking their land find a field transformed into a big blowout. The sand carried away by the wind is deposited in great drifts, by which new sand hills are formed or the old ones increased in height. There would be no stability whatever were it not for certain grasses that seem to thrive best just in these blowouts. When well established their roots bind the sand together and their decaying parts enrich the soil. Thus they give protection to the sand hills and render them suitable for other vegetation. Such blowout grasses are: *Calamorilfa longifolia, Redfieldia flexuosa, Eragrostis tenuis, Muhlenbergia pungens.*

TOPOGRAPHY AND FLORAL DISTRICTS.

As can be seen from the map, the route of our travel closely resembles a figure 8, the side of the figure following the Middle Loup River and its tributary, the Dismal, the ends and the cross at the middle traversing the sand hills. We also crossed the eastern half somewhat diagonally between Plummer Ford and Thedford. The region is divisible into five districts, each of which was traversed by our route:

1. Middle Loup Valley.
2. Dismal River Valley.
3. Sand hills of Thomas County, a barren sand-hill region.
4. Sand hills of Hooker County, a dry valley sand-hill region.
5. Sand hills of Grant County, a wet valley sand-hill region.

MIDDLE LOUP VALLEY.

The Middle Loup River is here a very swift stream, but without any true waterfalls. The slope of the valley, deduced from the altitude of the railroad at the stations, is, in Thomas County, between Seneca and Halsey, on an average, over 1.5 meters per kilometer, or 8⅓ feet to the mile. In Hooker County it is still greater, perhaps a little less than 2.5 meters per kilometer, or 13 feet to the mile. The fall of the river is perhaps only one-third or one-half as much, as the stream winds from one side of the valley to the other. In Thomas County the valley is from 1.3 to 4 kilometers, or from one-half to 1½ miles, wide and consists of rich meadow land. The soil in the whole region is, as a rule, sandy. The sand hills rise about 60 to 100 meters (200 to 300 feet), or sometimes higher, over the valley. North of Mullen, in Hooker County, the valley is much narrower, the river still more winding, and the bottom filled with lagoons and swamps—remains of old river beds. The valley here makes good pasture land, but is usually too rough for meadow. Still higher, especially above the forks, the valley is narrower yet, and the bottom land has almost disappeared.

DISMAL RIVER VALLEY.

Dismal River closely resembles the Middle Loup, but is a smaller stream. About 400 or 500 meters above the junction of the two forks of Dismal River each has a fall 3.5 or 4 meters in height. The ledge over which the water falls is not of a rocky, but rather of a clayey, formation. It is easily cut by a knife and crumbles when dried. The valley of Dismal River is much narrower than that of the Middle Loup, while the river is more winding, and here and there makes deep cuts (sometimes 100 meters deep) into the surrounding sand hills. The trail we followed left the valley at several places on account of these cuts and ran over ridges 100 meters high or followed dry valleys running parallel with the river. We were compelled to ford the river three times within a space of 10 miles. The valley of the lower Dismal River—for instance, south of Thedford—is swampy and resembles that of the Middle Loup at Mullen. Farther up the stream, especially on

the south side, the hills become much higher than those along the Middle Loup. At Plummer Ford they are about 150 meters high. Between Mr. Crumb's horse ranch and the forks, the valley becomes a narrow canyon, perhaps 200 meters deep, the road running on the hillside about 100 meters above the river. At the forks and along the South Dismal, the sand hills on the south side are at some distance from the river, leaving a dry sandy prairie 3 kilometers in width.

THE BARREN SAND HILLS.

I have used the term "barren", not because these sand hills are without vegetation, but because they are at present of very little use to man. Save near the Middle Loup Valley, where the hills are less sandy and are intermixed with small dry valleys, the district between Thedford and Dismal River is made up of sand hill after sand hill with scarcely a grassy valley between. This region contains nothing but the true sand-hill vegetation. Seen from one of the highest points, the hills appear like billows of the ocean. In the eastern part of Thomas County, as well as north of Middle Loup, the country assumes more and more the character of the next district.

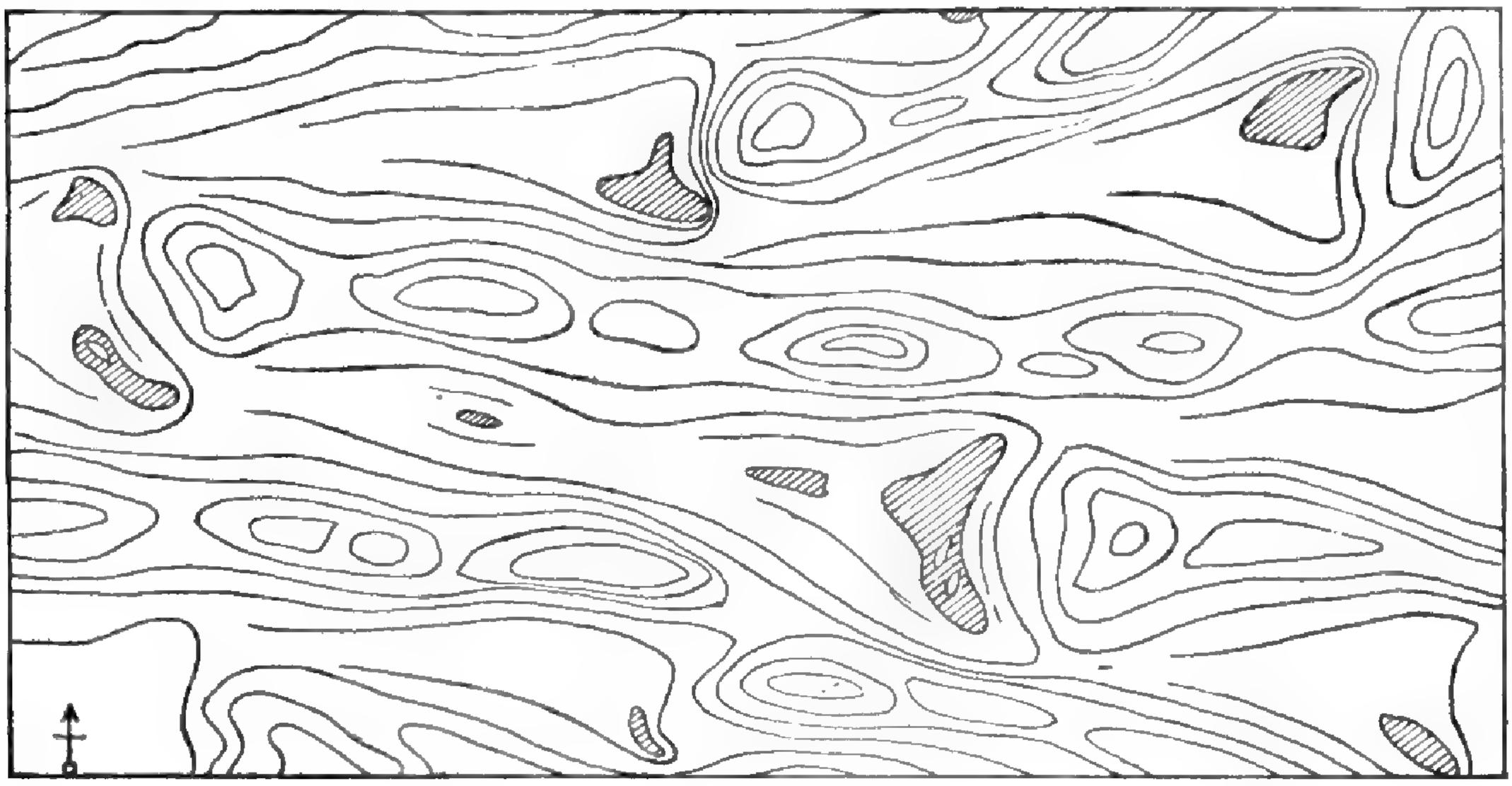
THE DRY VALLEY SAND HILLS.

This district consists of sand hills, mostly running east and west, intermixed with long continuous valleys with more or less perfect underground drainage. These valleys are sometimes 0.5 kilometer or more wide, the soil as a rule a sandy loam. Many of them are under cultivation, and in seasons of sufficient rainfall they yield good crops. Other valleys are utilized for pasture, and in wet seasons can be mowed for hay. The larger part of Hooker County is composed of such sand hills and valleys.

THE WET VALLEY SAND HILLS.

The arrangement of the sand hills is here more irregular, but the general trend, like that of the dry valley sand hills, is east and west. The hills are generally very high and steep, and it is difficult, sometimes nearly impossible, to cross from one valley to another in a north and south direction. East and west the valleys are somewhat connected, but the drainage from one to another is imperfect or wholly wanting. In shape the valleys are more or less elongated-triangular, with the apex toward the west and the base toward the east. In one or the other, or sometimes in both, of the eastern corners there is a smaller or larger pond or slough, invariably called a lake. Sometimes the two lakes are connected and form a single body of water occupying the whole of the eastern end. In most cases the highest hill was north of the lake; the next highest, east; and the lowest, south. Frequently each of the corners of the valley was connected east and west by a depression in the hills with adjacent valleys, the western end with a higher, the two eastern with lower ones. The accompanying figure shows schematically the form of the wet valleys northwest of Whitman.

These valleys are excellent meadows. In the summer the sloughs or lakes often dry out, and in general the amount of water varies much according to the season. Some years there may be a good meadow



where the year before was a lake or a dry valley. From Pound and Smith's report in the publication of the Botanical Survey of Nebraska, No. II, I find that regions like these were met with in Cherry County.

CLIMATIC CONDITIONS.

The altitude of the region is from about 800 meters to over 1,200 meters. The railroad tracks at Halsey are 2,695 feet or 821.4 meters above the sea level; those at Whitman, 3,588 feet or 1,095.6 meters. The hills rise much more than 100 meters above the valley in which the railroad runs, the highest therefore attaining an altitude of over 1,200 meters.

There have been local weather stations at Thedford and Whitman for four years. The reports from 1890 to 1892 are very incomplete, and the report for 1893 at date of writing is not yet published. It has therefore been impossible to obtain the exact data concerning temperature and rainfall. According to the excellent meteorological charts prepared by Prof. Goodwin D. Swezey, of Doan College, Crete, Nebr.,[1] and published in the Report of the Nebraska State Board of Agriculture, 1892, the average rainfall in this part of Nebraska during January, February, and March is less than 1 inch per month; during April, 1 to 2 inches; during May, June, and July, 3 to 4 inches; during August, 1 to 2 inches; and during September, October, November, and December, less than 1 inch. The average rainfall for the growing season, April to August, is 14 to 16 inches, and the average total per year is 20 inches. This seems to speak favorably for the sand hills, but another fact must be taken into consideration, viz, that the sand hills with their scant

[1] Now at the University of Nebraska.

vegetation become intensely heated by the sun, and generate hot winds which scorch the grain fields. On most days from July 4 to August 24 the thermometer records at noon 90° F., or at times 100° and even higher. The highest temperature recorded at Thedford was 112° in 1890 and 113° in 1892. The mean temperature there for those two years was 78.4° and 80.2° for June, and 82° and 81° for July.

The prevailing wind during the summer was from the southeast. From Professor Swezey's report this appears to have been the case during the year 1892 also. The most rain came from northwest, the clouds going against the wind. In most cases, however, the wind changed during the heaviest shower, both wind and cloud then coming from northwest. From June 13 to August 10 we had at least one rainy day each week, but after that time the showers were few. In the night between August 2 and 3, a heavy dew fell as before mentioned, and a less heavy one the next night. These were the only times any dew was noticed during my stay.

FLORA.

I have described five districts, the first two of which, the Middle Loup and the Dismal River, are really branches of one. Their vegetation is nearly uniform, and is also similar to that of the wet-valley district, but with the addition of some eastern plants which have ascended the river valleys. The plants of these three regions may be divided into four classes: (1) Sand-hill plants; (2) dry-valley or hillside plants; (3) wet-valley plants; (4) aquatic plants. In the fourth floral region district, the dry-valley region, the last two classes are lacking, and in the third, the barren sand hill region, plants of the first class only are found.

SAND-HILL VEGETATION.

The most characteristic plants of the sand hills are of course the four blowout grasses mentioned above, viz: *Calamovilfa longifolia*, *Eragrostis tenuis*, *Redfieldia flexuosa*, and *Muhlenbergia pungens*, of which the first two are also found on nearly every sand hill. Next to these four the following are the most common or the most characteristic herbaceous plants:

Andropogon scoparius.
Andropogon hallii.
Stipa spartea.
Stipa comata.
Psoralea lanceolata.
Psoralea digitata.
Carduus plattensis.
Opuntia rafinesquii.
Euphorbia petaloidea.
Euphorbia geyeri.
Chrysopsis villosa.
Cristatella jamesii.
Corispermum hyssopifolium.
Croton texensis.
Acerates viridiflora.
Acerates angustifolia.
Acerates lanuginosa.
Astragalus ceramicus longifolius.
Commelina virginica.
Tradescantia virginiana.
Yucca glauca.
Amaranthus torreyi.
Fraelichia floridana.
Cyperus schweinitzii.
Lacinaria squarrosa.
Cycloloma atriplicifolia.
Argemone albiflora.

The following are characteristic undershrubs:

Prunus besseyi.
Ceanothus ovatus.
Amorpha canescens.
Kuhnistera villosa.

It must not be understood that those mentioned are confined to the sand hills alone. Many run down into the dry valleys, as for instance, the Stipæ, Amaranthus, and Argemone; some even to the river banks, as Tradescantia. As I have said before, and as may be seen from the list, the sand hills are far from destitute of vegetation. The plants, however, never grow close together, but usually 2 to 5 decimeters apart, so that the sand is always seen. In many places, a few centimeters below the surface, which is perfectly white, the sand is mixed with half-decayed, or, rather, poorly cured and half-burned vegetable matter, resembling black tea. Whether it is a product of the prairie fire or of the sun-heated sand, I can not tell.

DRY-VALLEY VEGETATION.

This is in fact identical with the general prairie flora of the State, with the addition of some sand-hill species, which run down from the hills. The most characteristic are of course the prairie grasses, some of which are enumerated below under the heading "Native forage plants." Other common plants are:

Sisyrinchium angustifolium.
Spiesia lambertii.
Œnothera serrulata.
Verbena stricta.
Potentilla arguta.
Ambrosia psilostachya.
Psoralea argophylla.
Allium nuttallii.
Monarda citriodora.
Verbena hastata.
Artemisia canadensis.
Artemisia gnaphalodes.

WET-VALLEY VEGETATION.

The wet-valley flora is of course the richest as far as species are concerned. To this belong most of the hay grasses of the region. Other common plants of the meadows are:

Equisetum lævigatum.
Galium trifidum.
Galium triflorum.
Galium aparine.
Stellaria longifolia.
Campanula aparinoides.
Lythrum alatum.
Potentilla monspeliensis.

Among the bushes the following are common:

Habenaria hyperborea.
Vagnera stellata.
Polygonatum commutatum.
Circæa lutetiana.
Geum strictum.
Thalictrum purpurascens.
Geum canadense.
Scutellaria galericulata.

AQUATIC FLORA.

Most of the aquatic plants are very local, each lake or pond having its peculiar species. Those common throughout the region are:

Lemna minor.
Lemna trisulca.
Sagittaria latifolia.
Utricularia vulgaris.
Potamogeton pectinatus.
Batrachium divaricatum.

The following are found in both rivers:

Lemna polyrrhiza.
Typha latifolia.
Sparganium eurycarpum.
Potamogeton lonchites.
Potamogeton pusillus.
Berula erecta.

WEEDS.

Several eastern weeds have come into the region, and many of the native plants also act as if they were likely to become more or less troublesome. The worst of the weeds introduced is the Russian thistle (*Salsola kali tragus*), but it has not yet established itself firmly. It was found along the railroad at Mullen, and more abundantly at Thedford, while a few specimens were also collected near Plummer Ford, 15 miles from the railroad. Other weeds or plants likely to become noxious are:

Helianthus annuus.
Helianthus petiolaris.
Chenopodium album.
Chenopodium leptophyllum.
Chenopodium hybridum.
Acnida tamariscina.
Portulaca oleracea.
Rumex venosus.
Cycloloma atriplicifolia.
Eragrostis major.
Eragrostis caroliniana.
Xanthium canadense.
Chamæraphis viridis.
Cenchrus tribuloides.
Panicum capillare.
Amaranthus albus.
Amaranthus blitoides.
Amaranthus retroflexus.
Lappula redowskii occidentalis.
Lappula deflexa americana.
Erigeron canadense.
Lepidium incisum.
Iva xanthifolia.
Ambrosia artemisiæfolia.

Three plants were almost exclusively confined to the "prairie-dog towns" here as well as in western Nebraska, viz, *Solanum triflorum*,[1] *Cryptanthe crassisepala*, *Chenopodium fremontii incanum*.

NATIVE TREES AND SHRUBS.

The most abundant woody plant is *Amorpha canescens*, which is common all over the sand hills. Next comes the Western sand cherry (*Prunus besseyi*). On the sand hills around Thedford the third in order is *Ceanothus ovatus*. *Kuhnistera villosa*, which should, perhaps, be classed among the under-shrubs, is as common as any of the class. All these belong to the true sand-hill flora. Nearly all the other woody plants are confined to the Middle Loup and Dismal River valleys. A few, as, for instance, *Salix fluviatilis*, *Symphoricarpos occidentalis*, *Prunus americana*, *Amorpha fruticosa*, are also found in some of the wet valleys.

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[1] Since this report was written a note concerning this plant has been found in E. P. James's catalogue of plants collected on Long's expedition which reads: "I have never seen it except immediately about the burrowing places of the marmots or prairie dogs, where it is almost constantly found."

Amorpha fruticosa and *Salix fluviatilis* line the rivers for long distances and are the most common woody plants of the lowlands. Two other Salices, *Cornus stolonifera*, *Ribes floridum*, an upright form of *Rhus radicans*, *Rosa fendleri*, and *Prunus americana* are also common on or near the river banks.

On the hillsides and in the dry parts of the valleys the most common woody plants are *Prunus demissa* and *Symphoricarpos occidentalis*. *Acer negundo*, *Rosa arkansana*, *Ribes aureum*, and *Rhus trilobata* were also found here and there on the hillsides; also *Fraxinus pennsylvanica* and its variety *lanceolata*, with several intermediate forms. None of the latter were of large size, and most of them were only stunted shrubs. At Norway, Mullen, on the south prong of Middle Loup, and also on the Dismal River, some cottonwood (*Populus deltoides*) was found. *Celtis occidentalis* occurs on both rivers, but is not very common. Near the forks of the Dismal there were some specimens between 4 and 5 dm. in diameter. *Juniperus virginiana* was found along the Dismal River. Judging from the stumps and brush left, it must earlier have been a very common tree and of considerable size. What now remains consists mostly of young trees. *Parthenocissus quinquefolia* and *Vitis vulpina* were occasionally met with on the river banks. More local were *Celastrus scandens* and *Rubus occidentalis*, found near Plummer Ford; *Ribes gracile*, near Crumb's horse ranch; *Crataegus coccinea*, near the forks of Dismal River; *Ulmus americana*, on the South Dismal about 4 miles above the forks; and *Rhus glabra*, 3 miles below our first camp on Dismal River.

NATIVE FORAGE PLANTS.

The principal hay lands in the region are the wet valleys and that part of the Middle Loup bottom land which can be mowed. The grass land along the Dismal and the upper part of the Middle Loup is too narrow and too much cut up by the river to admit of mowing and hence must be used as pasture. Grant County, which consists mostly of sand hills and wet valleys, is a fair stock-raising country. The wet valleys are used chiefly as hay lands, while the dry valleys, the hillsides, and even the sand hills are used as pasture. The hay crop is here made up principally of the following grasses, which are arranged according to their relative value, considering partly quantity and partly quality. Those in the left-hand column are regarded as the better:

Andropogon provincialis.	*Agrostis exarata.*
Panicum virgatum.	*Panicularia nervata.*
Agropyron repens glaucum.	*Panicularia americana.*
Andropogon nutans.	*Spartina cynosuroides.*
Muhlenbergia racemosa.	*Beckmannia eruciformis.*
Phalaris arundinacea.	*Carex trichocarpa aristata.*
Agropyron violaceum (?) majus.	*Scirpus triangularis.*
Calamagrostis canadensis.	*Distichlis spicata stricta.*
Elymus canadensis.	*Eleocharis palustris.*

The meadows along Middle Loup contain all enumerated above with

the exception of *Beckmannia*, *Phalaris*, and *Distichlis*, and in addition thereto—

Calamagrostis neglecta.
Muhlenbergia mexicana.
Panicum scoparium.
Panicum dichotomum.
Sporobolus asperifolius.
Agrostis hiemalis.
Carex stipata.
Carex filiformis.
Carex nebraskensis.
Carex aurea.
Carex echinata radiata.
Equisetum lævigatum.

The last one is claimed to be a valuable hay grass.

The bottom land of Dismal River being too rough to mow is instead used for summer ranches. The forage consists of about the same plants as that of the Middle Loup Valley, with two additions, *Alopecurus geniculatus aristulatus* and *Agrostis hiemalis.*

The forage plants of the dry valleys, hillsides, and pockets of the sand hills consist mostly of the following species, of which some are of little value, however:

Bouteloua oligostachya.
Bouteloua hirsuta.
Bulbilis dactyloides.
Eatonia obtusata.
Koeleria cristata.
Andropogon scoparius.
Bouteloua curtipendula.
Sieglingia purpurea.
Panicum virgatum.
Agropyron repens glaucum.
Stipa spartea.
Stipa comata.
Elymus canadensis.
Andropogon hallii.
Paspalum setaceum.
Sporobolus cryptandrus.

The first five in the left-hand column are regarded as the best pasture grasses, while the first six in the right-hand column are often cut for hay when they grow in quantity.

On the prairies of the Middle Loup Valley a valuable addition to the pasture is made by the following, which grow in some places in quantity:

Poa arida.
Poa arida var.
Poa sp.
Poa pratensis var.

STOCK RAISING.

From the foregoing it can be seen that stock raising is and probably always will be the principal industry of the region. Before the Burlington and Missouri River Railroad was built the sand hills were overrun by the herds of the cattle ranches, but after the railroad came in the good land began to be settled, the herd laws were enforced, and the "cattle kings" were compelled to move their herds farther west. It was nearly impossible to keep the cattle from the fields of the settlers, and they were, moreover, in many places cut off from water. In Grant County, where there is plenty of natural grass land, the settlers have turned stockmen, but on a small scale. The wet valleys are used as hay land, and the drier part of the valleys and the sand hills as summer pasture. Winter pasturing can scarcely be resorted to at all, as those plants which in western Nebraska constitute winter pasturage are here comparatively rare, viz:

Bouteloua oligostachya.
Bouteloua hirta.
Bulbilis dactyloides.
Carex filifolia.

In Thomas and Hooker counties, where the natural hay land area is very limited, the settlers were compelled to resort to farming also. As a rule this has not been very successful, and the homesteaders of those counties are generally not wealthy. Many therefore wish that the "cattle kings," who always had money, were still in the region. In order to bring money again into the counties, meetings have been called for the purpose of petitioning Congress to pass bills authorizing the sale of the sand-hill lands at 15 cents an acre. Few of the settlers, however, are able to pay even 15 cents an acre for the Government land that they are now using and need as pasture for their stock. Practically the land would be sold in township lots or other large areas to stockmen. As I have said before, the sand hills can not be used for winter pasturage. Hay is therefore needed for the winter. All the hay lands are in the hands of the settlers. The stockmen would be obliged either to ship in hay or drive their cattle away in the fall, or, which would be easier, to buy out, or perhaps starve out, the settlers. This latter would not be very difficult, as the settlers could not dispense with the summer pasturage of which they would thus be deprived.

AGRICULTURE.

A part of the Middle Loup Valley in Thomas County and some of the dry valleys in Hooker and the northern part of Thomas counties are used for agricultural purposes. Garden vegetables seem to thrive well. On July 11 we bought new potatoes as large as goose eggs, Fine cabbage, tomatoes, onions, watermelons, and cucumbers were also seen. At one place an experiment with alfalfa was in progress. It did not give good results, owing mainly, I think, to ignorance of the proper method of growing this crop. Fine specimens of Russian millet (*Panicum miliaceum*) were brought into Thedford by a settler who had a field of perhaps 3 or 4 acres. In June I saw a fine field of common millet (*Chamæraphis italica*). The grain mostly planted is corn. Fields of oats and barley were also seen. The country, however, seems not to be very well adapted to agriculture. In June and July we saw very fine cornfields, but when we returned to the same place in August it was apparent that the crop would be but light. I learned that during preceding years some fine crops had been obtained; but, as a rule, farming does not seem to be paying well in this region. Some claim that there is too little rainfall. From the experience of this summer and from the published reports, however, the conclusion seems justified that the annual rainfall is sufficient, and that the great difficulty consists in a season of drought in August with hot winds, which scorch the growing crops. As the wind in the summer is usually from the south or southeast, the general belief is that the hot winds come from Kansas or even from Texas. As a rule, however, they are of a much nearer origin. It will not require a long time or the traverse of a great distance for the wind, blowing over the highly heated sand hills, to become intensely hot. It seems to me certain that the hot winds which

scorch the cornfields are generated in the sand-hill region. The only remedy would be to cover the hills with a dense vegetation which would shade the ground. There is no sod-forming grass that will grow there, nor apparently any deep-rooted perennial herb that would grow thick enough to cover the ground. The woody flora is the only remaining resort, and thus the question presents itself how this may be utilized for this purpose.

REFORESTING THE SAND HILLS.

I say reforesting, as many, and among them Dr. Chas. E. Bessey, think that the sand hills at one time were probably covered with woods. Pine logs have at a few places been found buried in the sand. There is a canyon in Custer County which still contains living pines. It is hard to explain how pine seed could have been carried from the pine ridge in Dawes and Sheridan counties to Custer County and none have been sown in the intermediate tract. It would be still more strange if the seed had come from Long Pine on the Niobrara, which is about 75 miles north of this canyon, as it would then have had to cross perhaps one hundred ridges of sand hills. Very likely in former days the pines grew, if not all over the hills, at least in many places among them. The red cedar is at present not uncommon on the hillsides along the Dismal River, and I myself found stumps and fragments of this tree at several places in the sand hills, where there was no vestige of living trees.

Without doubt trees will grow on the sand hills, if the proper kinds are selected and these are given the proper treatment. What species would be best, only repeated trials can determine, but these trials must be made under the light of facts with which students of forestry are already acquainted. The known adaptations of trees are to be compared with the demands of the proposed environment. A tree that can be thought of for this location must fulfill the following conditions:

1. It must be able to withstand the hot dry winds in the summer and the cold dry winds in the winter. It must be a tree in which the evaporation is small. The conifers with their small leaf surface would suggest themselves as being the best fitted to meet these requirements.

2. It must be a tree with a deep root system, which can reach the permanent moisture. The bull pine or Rocky Mountain yellow pine (*Pinus ponderosa scopulorum*) is little grown by nurserymen, because its deep root makes it hard to transplant; but this very fact makes it a desirable tree for the sand-hill region. A very deep root system is not, however, as necessary as it may seem, for most of the sand hills are better supplied with moisture than is generally believed. In many places the sand keeps moist a few inches below the surface. Near Plummer Ford I collected *Penstemon haydeni* on one of the highest sand hills, the top of which had recently been formed by sand from a blowout. To my surprise, I found the roots of the plant surrounded by

wet sand. There are hills, however, on which no one should attempt to grow wood, viz, those that contain a blowout, or are likely to contain one. Such hills, as a rule, are characterized by the blowout grasses; but hills on which the Stipæ, *Bouteloua hirta*, and *Panicum virgatum* grow may very well be used for tree planting.

3. It must be a tree native in poor soil. The black jack or northern scrub pine (*Pinus divaricata*), growing on the sand barrens of Wisconsin and upper Michigan, I think, would be a suitable tree. It would seem, also, that the Scotch pine (*Pinus sylvestris*) would fulfill the conditions. There is a large region in Sweden, just as sandy, of which almost the only vegetation, when I saw it last, some twenty years ago, was heather. The Swedish Government undertook to plant it with forest trees, especially *Pinus sylvestris*. From the papers I learn that the whole region now is a fine young pine forest. However, from the experiment made by Messrs. E. G. and Hudson Brunner in Holt County, under the direction of the Forestry Division of the United States Department of Agriculture, *Pinus sylvestris* does not seem to be of much value for this region. Perhaps the partial failure resulted from the seedlings being received in poor condition, or perhaps this pine, being a northern tree, can not endure the hot winds. If the latter were the case, however, *Pinus divaricata* ought to be similarly affected, but in the experiment referred to this seemed to be the very best of the trees tested.

Many have taken tree claims in this region, but the most have failed to make their trees grow; in fact, statements have been made, sometimes publicly, that it is impossible to do so. I believe the contrary. Most have failed just because they have tried to fulfill the requirements of the tree-planting law. This was made to fit the conditions of a prairie region with a hard sod, not those of the sand hills. A thorough cultivation of the ground, although highly recommended and repeatedly urged, is the worst kind of treatment for a tree plantation in the sand hills. This has been plainly shown by the experiments made in Holt County. One of four lots planted with trees was cultivated, and at the end of the first year only 5 per cent of the trees were living. On the other lots, not cultivated, the result was good. After two years the average of living trees on the three lots was 51 per cent. A thorough cultivation of a field in the sand hills means to make it a blowout, or at least to dry up all its moisture. Besides this, cultivation here would prepare the ground for weeds instead of killing them. The less the ground is disturbed the better.

The best tree for planting seems to me to be *Pinus ponderosa scopulorum*. Perhaps it would be wisest to plant it mixed with *Pinus divaricata*, or other conifers, or even such deciduous trees as may be likely to succeed here. A tree claim was visited on one of the hills, 2 or 3 miles north of Middle Loup and 5 or 6 miles from Mullen, in which the species planted were box elder, green ash, and cottonwood. About 60 or 70 per cent had lived through, and all had made a good growth.

Perhaps the seeds of the Rocky Mountain yellow pine could be planted directly in the sand hills. Judge J. C. Tolivar, of Ainsworth, Nebr., gathered a few bushels of cones in the first part of September, 1893, and placed them in the sun to dry. The cones opened in a few days, and he immediately planted the seeds on the sand hills of his tree claim. A few days later the young pines came up, and they are said to have grown to a height of 6 to 8 inches before the frost set in. The rapidity of the germination of the seed has been confirmed in the greenhouse of the University of Nebraska. The method of Judge Tolivar, if successful, as it promises to be, will be the least expensive. It may be that the young trees will need some protection against the sun and hot winds the first two summers, but when 2 years old the roots will have reached the permanent moisture and no care will need to be taken of them except to keep away the prairie fires. It would be desirable to find some tree or shrub that would furnish the necessary protection the first two years. The box elder is excellent for shading, but it is not easier to grow than the pine itself. The native shrubs of the sand hills are mostly too low. *Prunus besseyi* generally trails in the sand. *Ceanothus ovatus* is mostly too bushy. *Amorpha canescens* and *Kuhnistera villosa* have a good amount of foliage and would give some shade for a year or two. Better than these would be *Pinus divaricata*, if it is as well adapted to the region as reports seem to indicate.

If forest trees are planted to produce climatic effects, they must be grown in large tracts. The groves on the tree claims do little or nothing toward changing the conditions of the region. Extensive planting could be done by the General Government or by the State, or at least under the direction of one of these, perhaps best on a cooperative plan, like the one proposed by Mr. Fernow, Chief of the Forestry Division, United States Department of Agriculture. This planting should of course be undertaken only on lands useless for agricultural purposes. In the region of our summer's collecting was a tract of land of this kind between Middle Loup and Dismal rivers, in Thomas County, a distance of about 15 miles. The land consists mostly of sand hills, with scarcely any grassy valleys between. The hills along the rivers could be used as summer pastures for a width of 4 or 5 miles. The cattle seldom go farther, indeed, as a rule, scarcely so far, from water. A belt about 6 miles in width is then left, of no use whatever. Even the hills near the rivers are worth so little for grazing that the land would increase many times in value if covered with woods.

CATALOGUE OF SPECIES.

In determining the plants of this collection, I have had help from the following botanists, to whom thanks are due: Mr. J. K. Small has determined the species of *Polygonum*, Mr. J. G. Smith those of *Sagittaria*, and Dr. William Trelease those of *Epilobium*. The Cactaceæ were sent to Prof. J. M. Coulter. The determination of the species of

Juncus has been verified by Mr. Frederick V. Coville, and that of the grasses by Prof. F. Lamson Scribner and Mr. L. H. Dewey.

Acknowledgment is also due to the Academy of Natural Sciences of Philadelphia for the loan of specimens for comparison. All the plants have been compared with the collections in the National Herbarium and the Herbarium of the University of Nebraska.[1]

RANUNCULACEÆ.

Clematis ligusticifolia Nutt.; Torr. & Gray Fl. i, 9 (1838).
Rare; on a hillside near Plummer Ford, Dismal River, August 22, 24 (No. 1717).

Anemone cylindrica Gray, Ann. Lyc. N. Y. iii, 221 (1836).
Banks of Dismal River, south of Thedford, June 27 (No. 1431).

Thalictrum purpurascens L. Sp. Pl. i, 546 (1753).
A tall, puberulent form with thick leaves, which are paler beneath, was very common among the bushes along the streams. On Middle Loup River at Natick, June 20, and Norway, June 22, 23; on Dismal River, south of Thedford, June 27; at Plummer Ford, July 3; South Dismal River, August 14 (No. 1413).

Batrachium divaricatum (Schrank) Wimm. Fl. Schles. 10 (1841); *Ranunculus divaricatus* Schrank, Baier. Fl. ii, 104 (1789).

The plant seems to be nearest this species, which has been regarded as the same as *R. circinatus* Sibth.; but my specimens differ from European ones of that species in having more flaccid leaves with longer and finer divisions. In the latter the lobes are short and rigid, spreading in a circle around the stem. The Nebraska specimens, viz, my No. 4 from Lodge Pole Creek (1891) and those of the present collection, have the very fine divisions more or less ascending. The sessile leaves and the much longer peduncles distinguish it from forms of *Batrachium trichophyllum*. It was collected in Middle Loup River, near Thedford, June 16, and in Dismal River, near Plummer Ford, July 3 (No. 1335). It was also seen in the lakes of Grant County.

Cyrtorrhyncha cymbalaria (Pursh) Britton, Mem. Torr. Club. v, 161 (1894); *Ranunculus cymbalaria* Pursh, Fl. i, 392 (1814).

The oldest name for this species, however, seems to be *Ranunculus salsuginosus* Pallas.[2] According to Ledebour[3] *R. salsuginosus* Pallas,[2] and *R. salsuginosus* DC.[4] are not the same. According to the same author, the former is *R. cymbalaria* Pursh, and the latter *R. plantaginifolius* Murr. and *R. ruthenicus* Jacq., a similar, but larger, plant. Pallas in his "Reise,"[2] does not give a description under the name *R. salsuginosus*, but bases this on an already described and figured plant, giving as synonym "*Ranunculus repens flore in caule singularis, fol. varie sectis;* Amman ruth. n. 107, tab. 13, fig. 2." As I have no access to Amman's Stirpium Rariorum Rutheno, I can not tell whether this is our *B. cymbalaria* or not. I am, however, strongly inclined to believe that Ledebour is right, as he cites the synonym given above, while neither De Candolle nor any American author, as far as I know, uses it as a reference to *R. salsuginosus*. De Candolle gives it as a synonym of *R. cymbalaria*. Common on moist, sandy soil; near Thedford, June 15, 16, and Whitman, August 1 (No. 1334).

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[1] On my return from Washington, I visited Columbia College and Harvard University, staying one week at each place. I hereby extend my thanks to Dr. N. L. Britton and Dr. B. L. Robinson for the use of the herbaria and botanical libraries of their respective institutions, and to the former and Mr. J. M. Greenman for kind assistance given. The valuable notes taken at both places have been incorporated in the following catalogue.

[2] Reise d. versch. Prov. Russ. Reichs, iii, 213 (1776).

[3] Flora Ross. i, 33, 34.

[4] Syst. i, 251 and Prodr. i, 33.

Ranunculus sceleratus L. Sp. Pl. i, 551 (1753).

Banks of Middle Loup, Thedford, June 16; Mullen, July 18; dry lakes west of Whitman, September 19 (No. 1333).

Ranunculus pennsylvanicus L. f. Suppl. 272 (1781); or, *R. canadensis* Jacq. Misc. ii, 342 (1781).

Very variable; it has sometimes sessile leaflets. Specimens fully 1.5 meters high were found on the Middle Loup, near Mullen, July 17. It was also collected at the forks of that river July 26, and near Cody's Lakes, August 9 (No. 1559).

Ranunculus sp.

A low and apparently subcespitose plant, rooting in the mud. I found no specimens in bloom or in fruit. The leaves somewhat resemble in texture those of *R. nuttallii*, especially those of the variety *repens*,[1] but they are larger, ternately divided, the divisions cleft into 3-lobed segments. It is common in the dry lakes of Grant County; September 19 (No. 1789).

Delphinium carolinianum Walt. Fl. Car. 155 (1788).

A low, leafly form peculiar to the sand hills and dry plains of western Nebraska. The plant is glandular as well as pubescent, especially so on the peduncle. It is the same form as No. 8 of my western Nebraska collection. Thedford, June 19; Norway, June 22; Plummer Ford, July 8 (No. 1360).

PAPAVERACEÆ.

Argemone albiflora Hornem. Hort. Hafn. 489 (1813–15).

Dr. Watson referred the Argemone common on the plains east of the Rocky Mountains to *A. platyceras* Link & Otto, Icon. i, 85 t. 43 (1828). Hornemann's name is older, and that it belongs to this and not to the white-flowered form of *A. mexicana*, to which De Candolle referred it, can be seen from the original description: "Capsulis 5–6-valvibus pedunculatis, foliis subspinosis."

In *A. albiflora* the capsules are generally peduncled, while in *A. mexicana* they are, as a rule, subtended by the uppermost leaves. The figure and description of *A. albiflora*, published a few years after the original description in Bot. Mag. xlix, 2342, corresponds to our plant. Neither it nor our plant has the white blotches on the leaves characteristic of *A. mexicana*. Thedford, June 19; Dismal River, June 29; Mullen, July 19 (No. 1358).

NYMPHÆACEÆ.

Nymphæa advena Soland. in Ait. Hort. Kew. ii, 226 (1789).

This was collected only in Swan Lake, Grant County, August 7 (No. 1650).

CRUCIFERÆ.

Roripa palustris hispida (Desv.); *Brachylobus hispidus* Desv. Journ. Bot. iii, 183 (1809).

In the lake region of Grant County, rare; 3 miles northeast of Whitman, July 31, and northwest of the same place, September 19 (No. 1787).

Roripa obtusa (Nutt.) Britton, Mem. Torr. Club, v, 169 (1894); *Nasturtium obtusum* Nutt.; Torr. & Gr. Fl. i, 74 (1838).

In the lake region northeast of Whitman, July 29; 15 miles south of same place, August 3; west of same, September 19 (No. 1626).

? Cardamine hirsuta L. Sp. Pl. ii, 655 (1753).

Only three small specimens were collected, these in springs near Plummer Ford, August 3. On account of the scanty material I can not determine to which species they belong. I place them for the present under *C. hirsuta*, although they differ from

[1] *R. multifidus repens* Wats. Bot. King Surv. v, 8 (1871).

the European form of that species, in being perfectly smooth. My specimens are all small, only 1 dm. or less in length, rooting in the mud, and with rounded leaflets, sinuately 3-lobed at the apex. New to Nebraska (No. 1720).

Arabis glabra (L.) Bernh. Syst. Verz. Erf. 195 (1800); *Turritis glabra* L. Sp. Pl. ii, 666 (1753); *Arabis perfoliata* Lam. Encycl. i, 219 (1783).

This plant was found only at Plummer Ford, July 6 (No. 1508).

Arabis hirsuta (L.) Scop. Fl. Carn. ed. 2, ii, 30 (1772); *Turritis hirsuta* L. Sp. Pl. ii, 666 (1753).

Only one specimen was collected: Norway, June 22 (No. 1405).

Draba caroliniana micrantha (Nutt.) Gray, Man. ed. 5, 72 (1867); *Draba micrantha* Nutt.; Torr. & Gr. Fl. i, 109 (1838),

Rare; Thedford, June 15 (No. 1837).

Erysimum cheiranthoides L. Sp. Pl. ii, 661 (1753).

Not common; only a few specimens were secured. Plummer Ford, July 3; Forks of Dismal River, July 11 (No. 1454).

Lesquerella argentea (Pursh) MacMillan, Metasp. Minn. Val. 203 (1892); *Myagrum argenteum* Pursh, Fl. ii, 434 (1814).

Collected on the railroad embankment near Thedford, June 14 and 17 (No. 1281).

Lepidium intermedium Gray, Pl. Wright. ii, 15 (1852); *L. incisum* Roth, Neue Beitr. i, 224 (1802).

Thedford, June 15; Plummer Ford, July 4 (No. 1304).

Raphanus sativus L. Sp. Pl. ii, 669 (1753).

Escaped: near Thedford, August 26 (No. 1729).

CAPPARIDACEÆ.

Cleome serrulata Pursh, Fl. ii, 441 (1814).

Found only along the railroad embankment east of Mullen, July 20 (No. 1587).

Cristatella jamesii Torr. & Gr. Fl. i, 124 (1838).

In the sand hills, south of East Cody's Lake, August 9; Thedford, August 26; Natick, September 11 (No. 1664).

VIOLACEÆ.

Viola obliqua Hill, Hort. Kew. 316, t. 12 (1769); *Viola palmata obliqua* Hitchcock, Trans. St. Louis Acad. v, 487 (1891).

Only one plant collected on the banks of Middle Loup River, Thedford, June 16 (No. 1336).

CARYOPHYLLACEÆ.

Silene antirrhina L. Sp. Pl. i, 419 (1753).

Thedford, June 17; Dismal River, June 29 (No. 1349).

Lychnis drummondii (Hook.) Wats. Bot. King Surv. 37 (1871); *Silene drummondii* Hook. Fl. Bor. Amer. i, 89 (1830).

Hillside, near Plummer Ford, July 3 (No. 1471).

Alsine longifolia (Muhl.) Britton, Mem. Torr. Club, v, 150 (1894); *Stellaria longifolia* Muhl.; Willd. Enum. 479 (1809).

Spergulastrum gramineum[1] is the oldest name, but *A. graminea* is not available, as it is used for a European species. Very common in wet valleys; Thedford, June 15, 16; Plummer Ford, July 3 (No. 1295).

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[1] Mx. Fl. i, 276 (1803).

AIZOACEÆ.

Mollugo verticillata L. Sp. Pl. i, 89 (1753).
On the railroad embankment west of Mullen, September 15 (No. 1773).

PORTULACACEÆ.

Portulaca oleracea L. Sp. Pl. i, 445 (1753).
This is a common weed in eastern Nebraska, but here grows very sparingly in fields. Forks of Dismal River, July 11; Mullen, July 17 (No. 1566).

Talinum teretifolium Pursh, Fl. i, 365 (1814).
My specimens are small, with flowers scarcely larger than those of *T. parviflorum*. Sand hills, Thedford, September 8 (No. 1732).

HYPERICACEÆ.

Hypericum canadense L. Sp. Pl. ii, 785 (1753).
In wet meadows; Cody's Lakes, August 9; South Dismal River, August 11 (No. 1656).

Hypericum canadense majus Gray, Man. ed. 5, 86 (1867).
Gray wrote the varietal name *major*, which form has been used by botanists nearly without an exception. Some hold this as a species distinct from *H. canadense*, but it often grows together with the species and grades into it. South Dismal River, August 11 (No. 1826).

Elodes virginica (L.) Nutt. Gen. ii, 17 (1818); *Hypericum virginicum* L. Sp. Pl. ed. 2, ii, 1104 (1763).
In wet valleys, but not common: Thedford, August 9; Natick, September 11 (No. 1703).

POLYGALACEÆ.

Polygala verticillata L. Sp. Pl. ii, 706 (1753).
Near the railroad, west of Mullen, July 24. No specimens in my collection.

MALVACEÆ.

Malvastrum coccineum (Nutt.) Gray, Mem. Amer. Acad. iv, 21 (1848); *Malva coccinea* Nutt., Fraser's Cat. (1813).
Sand hills near Thedford, June 14 (No. 1357).

LINACEÆ.

Linum rigidum Pursh, Fl. i, 210 (1814).
The most common form of this species in Nebraska is about 3 or 4 dm. high with several slender stems from a perennial caudex, and having the leaves distant. This was collected near Thedford, June 19, and on Dismal River, June 26 (No. 1361).
I collected also another form about 1.5 dm. high with a single stout, much-branched stem, the branches forming a nearly flat top. The internodes were about one-half the length of the leaves. Railroad embankment, Thedford, June 14; Mullen, July 20 (No. 1255).

OXALIDACEÆ.

Oxalis stricta L. Sp. Pl. i, 435 (1753).
River banks: Thedford, June 17; Dismal River, June 29 (No. 1348).

BALSAMINACEÆ.

Impatiens biflora Walt. Fl. Car. 219 (1788).
In swampy places near South Dismal River, August 12 (No. 1681).

CELASTRACEÆ.

Celastrus scandens L. Sp. Pl. i, 196 (1753).

Common near Plummer Ford on the wooded bank of Dismal River, July 3, but not seen elsewhere. It is interesting to find this so far from the woody region of Nebraska. (No. 1453.)

RHAMNACEÆ.

Ceanothus ovatus Desf. Hist. Arb. ii, 381 (1809).

It is lower and has thicker leaves than the form collected by me in the Black Hills of South Dakota. It is one of the most common woody plants of the region, growing on the sand hills. Thedford, June 16 (No. 1325).

Ceanothus ovatus pubescens Wats. Index, i, 166 (1878).

This variety is perhaps the most common form of the species in the sand hill region. It grades into the typical form, but at the same time there are broad-leafed specimens scarcely distinguishable from *C. americanus*. Perhaps the two are but the extreme forms of a variable species. Thedford, June 17 and 20; Plummer Ford, July 3; South Dismal River, August 14 (No. 1352).

VITACEÆ.

Vitis vulpina L. Sp. Pl. i, 203 (1753).

The common form in Nebraska has smooth leaves, with a broad sinus. It was collected on the banks of the Dismal River, south of Thedford, June 29 (No. 1448). Another form with larger and thinner leaves, a narrower sinus, and larger bunches of grapes was found at Plummer Ford, July 3 (No. 1466). When young the leaves of this form are pubescent beneath. I think it is this form which has been regarded by Nebraska collectors as *Vitis cordifolia*. The latter is distinguished by a different dentation of the leaves, which are scarcely ever lobed, by a narrow and *acute* sinus, and by more elongated clusters. It does not appear to grow in Nebraska.

Parthenocissus quinquefolia (L.) Planch. in DC. Monogr. Phan. v, pt. 2, 448 (1887); *Hedera quinquefolia* L. Sp. Pl. i, 202 (1753).

Banks of Middle Loup River, near Natick, June 20 (No. 1375).

ACERACEÆ.

Acer negundo L. Sp. Pl. ii, 1056 (1753).

Few large or even middle-sized trees were found. Here and there on the hillsides near the rivers: Norway, June 22; Plummer Ford, July 3 (No. 1406).

ANACARDIACEÆ.

Rhus glabra L. Sp. Pl. i, 265 (1753).

Not common. Banks of Dismal River, June 28; Plummer Ford, August 22 (No. 1443).

Rhus trilobata Nutt.; Torr. & Gr. Fl. i, 219 (1838).

Local on the hills near the rivers: Norway, June 22; Dismal River, June 29; Forks of Dismal River, July 11 (No. 1407).

Rhus radicans toxicodendron (L.) Pers. Syn. i, 325 (1805); *Rhus toxicodendron* L. Sp. Pl. i, 266 (1753).

I believe that the western form of the "poison ivy" has good right to a varietal name. It is always an upright, strict shrub, 0.3 to 1 m. high, never climbing and without aerial rootlets. These characters are not seen in herbarium specimens, which mostly consist of a short piece of the top of the plant. In eastern Nebraska, the true *Rhus radicans*[1] is not uncommon in the woods. It is always tall, climbing by

[1] L. Sp. Pl. i, 266 (1753).

means of aerial rootlets. If intermediate forms are found they are rare. The variety is growing both in the woods and on the prairies. Common near the rivers: Natick, June 20 (No. 1416).

LEGUMINOSÆ.

Melilotus alba Desr. in Lam. Encyl. iv, 63 (1797).
Escaped: Banks of Middle Loup River, Thedford, August 26 (No. 1726).

Medicago sativa L. Sp. Pl. ii, 778 (1753).
Escaped: Thedford, June 16 (No. 1328).

Lotus americanus (Nutt.) Bisch. Linnæa, xiv, Suppl. 132 (1840); *Trigonella americana* Nutt. Gen. ii, 120 (1818).

The oldest name is *Lotus sericeus* Pursh,[1] but this name is preoccupied by *L. sericeus* DC.[2] Railroad embankment, near Mullen, July 24; Forks of Middle Loup, July 26 (No. 1592).

Psoralea argophylla Pursh, Fl. ii, 475 (1814).

The oldest name, *P. incana* Nutt.,[3] is a *nomen nudum*. Prairies: Thedford, June 21; Plummer Ford, July 3 (No. 1390).

Psoralea digitata Nutt.; Torr. & Gr. Fl. i, 300 (1838).

This includes also *P. campestris* Nutt.,[4] which should have narrower bracts and obtuse leaves. It can, however, scarcely be separated from *P. digitata*, even as a variety. Thedford, June 17, 20; Norway, June 22; Dismal River, June 27 (No. 1341).

Psoralea lanceolata Pursh, Fl. ii, 475 (1814).

Common in the sand hills. It spreads by long, slender rootstocks, sending up shoots here and there. At Seneca I found in a blowout a specimen, which had such a rootstock about 10 m. long. My specimens belong to the form which Miss A. M. Vail[5] calls *P. micrantha* Gray. I can not find any character that will separate the two even as varieties. They grow together and grade into each other as shown very well in the case of my No. 53 (1891) from Kearney. Thedford, June 17, 20; Norway, June 22; Dismal River, June 27 (No. 1327).

Amorpha fruticosa L. Sp. Pl. ii, 713 (1753).

Common along the streams. It was collected at Thedford, in flower, June 15; in fruit, September 8 (No. 1314).

Amorpha canescens Pursh, Fl. ii, 467 (1814).

Common all over the sand hills: Norway, June 22; Dismal River, June 29; Plummer Ford, July 8; Thedford, September 8 (No. 1417).

Kuhnistera villosa (Nutt.) Kuntze, Rev. Gen. Pl. i, 192 (1891); *Petalostemon villosus*, Nutt. Gen. ii, 85 (1818).

Common on the sand hills: Mullen, July 24; North of Whitman, July 31 (No. 1589).

Kuhnistera purpurea (Vent.) MacMillan, Metasp. Minn. Val. 329 (1892); *Dalea purpurea* Vent. Hort. Cels. t. 40 (1800).

Plummer Ford, July 3 (No. 1472).

Kuhnistera candida occidentalis Rydberg.[6]

Plummer Ford, July 3 to 8; Mullen, July 24 (No. 1480).

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[1] Fl. ii, 489 (1814).

[2] Cat. Hort. Monsp. (1813).

[3] Fraser's Cat. (1813).

[4] Torr. & Gr. Fl. i, 301.

[5] Bull. Torr. Club xxi, 94 (1894).

[6] In order to make *K. candida* better understood the following descriptions and localities are given:

KUHNISTERA CANDIDA (Willd.) Kuntze, Rev. Gen. Pl. i, 192 (1891); *Dalea candida* Willd. Sp. Pl. iii, 1337 (1803).

Flowers white, calyx angularly 10-striate, nearly glabrous, pubescent only on the

Kuhnistera candida multiflora (Nutt.) Rydberg; *Petalostemon multiflorus* Nutt. Journ. Acad. Phila. vii, 22 (1834).

My specimens approach the preceding variety as to the length of the head, etc. Mullen, July 18 (No. 1850).

Astragalus carolinianus L. Sp. Pl. ii, 757 (1753).

This includes also *A. canadensis* L., by which name it has generally been known. *Astragalus carolinianus* appears first on the page, and the description under it fits better our western plant. Forks of Dismal River, July 11; South Dismal, August 14 (No. 1537).

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margin, teeth short with a pair of glands at the base, leaflets 3 to 6 pairs. Stem (in the typical form) stout, generally upright, leaflets 1 to 3.5 cm. long and 3 to 10 mm. wide; heads oblong to cylindrical, dense even in fruit; bracts lanceolate or the upper ovate and cuspidate, much longer than the calyx, more persistent than in the other forms.

Illinois: Chicago, Henry H. Babcock.

Arkansas: Fort Smith, 1853, Bigelow (Whipple Exp.).

Louisiana: (Collector not given).

Kansas: Hutchinson, 1890, B. B. Smyth (a narrow-leafed form).

Nebraska: 1889, J. H. Holmes.

KUHNISTERA CANDIDA OCCIDENTALIS var. nov.

Stem generally slender and ascending, sometimes prostrate; leaflets 0.5 to 2 cm. long and 2 to 6 mm. wide; heads oblong to cylindrical, in fruit comparatively lax; bracts ovate and cuspidate, a little longer or sometimes shorter than the calyx, falling early.

Arizona: Fort Verde, 1883, H. H. Rusby; mesas around Mustang Mountains, 1884, C. G. Pringle; 1869 and 1890, Dr. Edward Palmer.

New Mexico: 1847, A. Fendler's No. 135; Calva Springs, 1878, W. B. Pease, No. 23; Las Vegas, 1881, Dr. G. R. Vasey.

Mexico: Hills near Guerrero, 1887, C. G. Pringle, No. 1216.

Texas: Mexican Boundary Survey, No. 241.

Colorado: E. Hall, No. 112 (with broad leaves); 1868, Dr. G. R. Vasey.

Nebraska: Scott's Bluff County and Lawrence Fork, 1891, P. A. Rydberg, No. 58b; No. 1480 of this collection.

South Dakota: Hot Springs, 1892, P. A. Rydberg, No. 612.

Specimens from two localities differ from the rest in being prostrate and having small (about 0.5 cm. long and 3 mm. wide) obovate, crowded leaflets.

Nebraska: Deuel County, 1891, P. A. Rydberg, No. 58.

N. W. Terr., British America: Moose Jaw Lake, 1880, John Macoun.

KUHNISTERA CANDIDA MULTIFLORA (Nutt.) nom. nov.

Stem slender, upright or ascending, corymbosely branched; heads capitate, short; bracts ovate and cuspidate, shorter than the calyx, deciduous.

Texas: Industry, 1843, F. Lindheimer; 1849, Charles Wright, No. 118; Delaware Mountains, 1853, Bigelow (Whipple Exp.); Gillespie County, G. Jermy, No. 609; Williams Creek, G. Jermy, No. 752; Hempstead, 1872, E. Hall, No. 138; Corpus Christi, 1889, Neally, No. 336.

Indian Territory: 1868, Dr. Edward Palmer, No. 89; Wichita Mountains, 1891, C. S. Sheldon, No. 259; Cimarron Canyon, 1891, M. A. Carleton, No. 369.

Kansas: Pratt, 1890, B. B. Smyth, Nos. 103 and 104; Onago, 1892, F. F. Crevecoeur, No. 1.

Nebraska: Kiowa Valley, 1891, P. A. Rydberg, No. 58c; No. 1850 of this collection.

Upright or ascending, or in one form prostrate, much branched; leaflets, 2 to 5 pairs, conspicuously glandular-punctate, linear-oblong or obovate, 0.5 to 2 cm. long, 2 to 6 mm. wide; obtuse or acutish; spikes oblong to cylindrical, 2 to 8 cm. long and generally less than 1 cm. in diameter, when young mostly acute, in fruit becoming long

Astragalus crassicarpus Nutt. Fraser's Cat. (1813).

From the characters of the fruit given in Fraser's Catalogue, this can be identified with *Astragalus caryocarpus* Ker;[1] which will therefore come under Nuttall's name. Not common in the region. Collected in fruit only: Norway, June 22 (No. 1419).

Astragalus lotiflorus Hook. Fl. Bor. Amer. i, 152 (1834).

Rare: only a few specimens collected in fruit near the Forks of Dismal River, July 13 (No. 1547).

Astragalus ceramicus longifolius (Pursh) nom. nov.; *Psoralea longifolia* Pursh, Fl. ii, 741 (1814).

The name *longifolius* could not be used as a specific name under *Astragalus* as there is already an *A. longifolius*,[2] but it may well be adopted as a varietal name under *Astragalus ceramicus*.[3] Common in the sand hills: Thedford, June 16 and 17; Norway, June 22 (No. 1322).

Spiesia lambertii (Pursh) Kuntze, Rev. Gen. Pl. i, 207 (1891); *Oxytropis lambertii* Pursh, Fl. ii, 740 (1814).

On the sand hills near Thedford, June 17; Norway, June 17 (No. 1285).

Glycyrrhiza lepidota Pursh, Fl. ii, 480 (1814).

In meadows: Thedford, June 20; Mullen, July 20 (No. 1384).

Meibomia canadensis (L.) Kuntze, Rev. Gen. i, 195 (1891); *Hedysarum canadense* L. Sp. Pl. ii, 748 (1753).

Miss Anna M. Vail, in a Torrey Bulletin,[4] gives it as a character of *M. canadensis* that the leaves are not reticulated below. In the form growing in the open mead-

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and comparatively lax; bracts mostly ovate, abruptly acuminate, a little longer, or sometimes shorter, than the calyx, deciduous, generally fallen at anthesis.

This has been a puzzling form for a long time. Dr. Gray called it *Petalostemon gracilis* in Plantæ Fendlerianæ remarking as follows: "Some of the specimens, I know not from which locality, have awn-pointed or cuspidate bracts, which are longer than the flower buds and are scarcely, if at all, distinguishable from *P. candidus*, to which the whole species is perhaps too closely related." Dr. Torrey in the Botany of the Mexican Boundary Survey, calls it *P. candidus*, adding the following note: "Our plant resembles Fendler's specimens named *P. gracilis* by Dr. Gray, but is erect." Later, it was named in manuscript by Dr. Gray, *Petalostemon candidus occidentalis*. As it is found in several herbaria under this name, I adopt the last part as a varietal name. I thought I had found characters which would distinguish the plant specifically from *K. candida*, viz, the more abrupt acumination of the bracts, and the less persistency of these and the bristles of the rachis, characters fairly constant in Nebraska specimens; but Mr. J. N. Rose, Assistant Botanist of the United States Department of Agriculture, who has also examined the plant, has shown me that these characters are not reliable. It is, I think, more nearly related to *K. multiflora;* in fact, can scarcely be distinguished from it except by the length and arrangement of the spikes. This is especially the case with my specimens from the Black Hills, in which the bracts are generally shorter than the calyx. As no definite line can be drawn between the present variety and *K. candida* on the one hand and *K. multiflora* on the other, I think it best to include all as varieties under one species. Perhaps *K. gracilis* should also be included therein. The Texas specimens in the National Herbarium, labeled *Petalostemon gracilis* belong to *K. candida occidentalis*. The Florida specimens are somewhat different and may be distinct.

[1] Edw. Bot. Mag. ii, 176 (1816).

[2] Lam. Encycl. i, 322 (1783).

[3] Sheldon, Minn. Bot. Stud. Bull. No. 9, 19 (1894).

[4] Bull. Torr. Club, xix, 114 (1892).

ows, however, they are so reticulated. Mullen, July 17 and 24 (No. 1565). In another form growing in the shade, the leaves are very thin and smooth with the nerves not prominent beneath and scarcely reticulated: South Dismal, August 12 (No. 1692).

Lespedeza capitata sericea Hook. Comp. Bot. Mag. i, 23 (1835).
Rare: on the prairies near Halsey, September 11 (No. 1746).

Lathyrus ornatus Nutt.; Torr. & Gr. Fl. i, 277 (1838).
This has been confounded with *L. polymorphus*. Sand hills, Thedford, June 16 and 19 (No. 1320).

Apios apios (L.) MacMillan, Bull. Torr. Club, xix, 15 (1892); *Glycine apios* L. Sp. Pl. ii, 753 (1753).
On the wooded banks of Dismal River, near Plummer Ford, August 22 (No. 1714).

Phaseolus pauciflorus Benth. Comm. Leg. Gen. 76 (1837).
South Dismal River, August 12; Thedford, August 19 (No. 1687).

Falcata comosa (L.) Kuntze, Rev. Gen. Pl. i, 182 (1891); *Glycine comosa* L. Sp. Pl. ii, 754 (1753).
Rare: on the banks of Middle Loup River, near Halsey, September 11 (No. 1749).

Falcata pitcheri (Torr. & Gr.) Kuntze, Rev. Gen. Pl. i, 182 (1891); *Amphicarpæa pitcheri* Torr. & Gr. Fl. i, 292 (1838).
More common than the last, on the banks of both rivers: Plummer Ford, August 23; Halsey, September 11 (No. 1715).

ROSACEÆ.

Prunus americana Marsh. Arb. Amer. 111 (1785).
A very variable tree or shrub. The common form in eastern Nebraska is a tree 3 to 6 m. high with oval or obovate leaves. This form was collected at Norway, June 22; Dismal River, June 29; Thedford, August 21; Mullen, September 15 (No. 1766). Another form with narrower leaves, with long acumination, was also found. The trees were generally much smaller, 2 to 4 m. high. Thedford, June 15; Mullen, September 15 (No. 1289). A third form is a low bush, 1 to 1.5 m. high, with smaller, conduplicate leaves, having more rounded teeth and generally two glands on the leaf-stalk. The branches are more divergent and the fruit about one-half the size of the typical form. South Dismal River, August 14 (No. 1693).

Prunus besseyi Bailey, Bull. Cornell Agr. Exp. Sta. 70, 261 (1894).
The main branches prostrate, generally buried in the sand, but the shoots of the year mostly upright; leaves obovate, in form resembling those of *P. cuneata*,[1] as redescribed by Prof. L. H. Bailey,[2] but much thicker and firmer and a little smaller, serrate, but not as sharply as in *P. pumila;* fruit large, generally about 1.5 to 2 cm. in diameter, on a short, stout peduncle. The specimens of *P. pumila* in the National Herbarium have much narrower leaves. In the sand cherry of western Nebraska the leaves are somewhat smaller and narrower than in that from the sand hills and come nearer to those of *P. pumila*.
Common throughout the sand hills and westward: Thedford, June 16, etc. (No. 1324).

Prunus demissa (Nutt.) Walp. Repert. ii, 10 (1843); *Cerasus demissa* Nutt.; Torr. & Gr. Fl. i, 411 (1840).
On the hillsides and in the drier part of the valleys, along both rivers: Thedford, June 14; Norway, June 22; Mullen, July 27; Dismal River, June 27 (No. 1256).

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[1] Raf. Ann. Nat. 11 (1820).
[2] Bull. Cornell Agr. Exp. Sta. 38, 63 (1892).

Rubus occidentalis L. Sp. Pl. i, 493 (1753).

In my specimens the fruit was very dark purple, rather than black, and hemispherical. On the wooded banks of Dismal River, near Plummer Ford, July 3 (No. 1465).

Fragaria vesca americana Porter, Bull. Torr. Club, xvii, 15 (1890).

Our American form has thinner and smoother leaves than the European, and as a rule also shorter peduncles and oftener elongated berries. Dr. Britton[1] makes it a distinct species and points out as a distinctive character that the achenes are superficial in the American species. But this is also the case in the European. In fact, De Candolle in his Prodromus uses just this character to separate *F. vesca* from *F. elatior* and *F. virginiana*. Plummer Ford, July 6 (No. 1481).

Potentilla arguta Pursh, Fl. ii, 736 (1814).

Plummer Ford, July 5 (No. 1474).

Potentilla pennsylvanica strigosa Pursh, Fl. i, 356 (1814).

Comparatively rare in the region: Forks of Middle Loup River, July 27; South Dismal, August 14 (No. 1611).

Potentilla pentandra Engelm.; Torr. & Gr. Fl. i, 447 (1840).

Very much branched and nearly as stout as the next. Perhaps this is a good species. Meadow, Haney's ranch, August 5 (No. 1819).

Potentilla monspeliensis L. Sp. Pl. i, 499 (1753).

Common: Plummer Ford, July 3; Haney's ranch, Grant County, August 4; Cody's Lakes, August 10 (No. 1469).

Geum canadense Jacq. Hort. Vind. ii, 82 (1772), not Murr. (1783).

This is an older name for *Geum album* Gmelin.[2] Plummer Ford, July 3 (No. 1456).

East of Mullen, July 19, two specimens were found with larger, light-yellow petals, and more incised leaves (No. 1608), perhaps a hybrid with *Geum strictum*.

Geum strictum Ait. Hort. Kew. ii, 217 (1789).

Common in the meadows along the rivers: Thedford, June 21; Dismal River, June 27; Natick, June 20 (No. 1364).

Some forms collected at Thedford, June 21, and Natick, June 20 (No. 1851), connect this with the next. They may be hybrids, but I incline to believe that *Geum strictum* and the next are varieties of the same species.

Geum macrophyllum Willd. Enum. i, 557 (1809).

This has been regarded as the same as *Geum japonicum* Thunberg. There is a specimen from Japan in the National Herbarium, labeled *G. japonicum*, but our plant is of another species. Natick, June 20; Plummer Ford, July 3 (No. 1458).

Agrimonia striata Mx. Fl. i, 287 (1803).

I had long been in doubt whether this was *Agrimonia eupatoria* L.[3] or not. To me it seemed different from the European form. Dr. N. L. Britton[4] shows that the American plant usually referred to *A. eupatoria* is distinct. Plummer Ford, July 4; Forks of Dismal River, July 11; Mullen, July 27 (No. 1495).

Rosa arkansana Porter, Port. & Coult. Fl. Col. 38 (1874).

Common throughout the State, but in the sand-hill region confined to the hills nearest to the streams. Thedford, June 21; Dismal River, June 28; Plummer Ford, July 5 (No. 1392).

Rosa fendleri Crepin, Bull. Soc. Bot. Belg. xv, 91 (1876).

I include under this all the forms collected on the lowlands and banks of the rivers. If all belong to *Rosa fendleri*, this species is a variable one, and yet I can not make out any constant characters that will warrant a distinction even of varieties. The

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[1] Bull. Torr. Club, xix, 222 (1892).

[2] Syst. ii, 861 (1796).

[3] Sp. Pl. i, 448.

[4] Bull. Torr. Club, xviii, 366, (1891).

form I think most typical has thin, nearly smooth leaves. The lower stipules are generally narrow and often entire, while the upper are broad and glandular-toothed. Thedford, June 21; Dismal River, June 28; Plummer Ford, July 5 (No. 1354). No. 1313 is a similar form, but with smaller leaflets; Thedford, June 16. No. 1849 is a form similar to the first, but with the leaves more hairy beneath, the fruit larger, spherical, and bright red, the stipules mostly narrow; Mullen, August 17; Thedford, September 7. The other forms collected have the leaves distinctly pubescent beneath and even somewhat glandular. In one the fruit is large and spherical, the sepals sometimes lobed and deciduous; in the other the fruit is smaller and pear-shaped, the sepals persistent. Notwithstanding this, I believe they are but forms of the same species. The first of the two (No. 1848) was collected at Natick, June 20; Dismal River, June 29; the other (No. 1606) near the Forks of Loup River, June 27.

Cratægus coccinea L. Sp. Pl. i, 476 (1753).

In my specimens the corymbs are slightly villose. The trees were small, the tallest only about 4 m. high. Near the Forks of Dismal River, July 11 (No. 1528).

RIBESIACEÆ.

Ribes floridum L'Her. Stirp. i, 4 (1784).

My specimens are more tomentose than usual. Common along the streams: Norway, June 22; Dismal River, June 27 (No. 1415).

Ribes aureum Pursh, Fl. i, 164 (1814).

The form with black fruit was not uncommon on the hillsides near the streams. Norway, June 22; Natick, June 20; Plummer Ford, July 3; Mullen, July 27 (No. 1366).

The form with golden-yellow fruit was found only on the Middle Fork of Middle Loup River, July 27 (No. 1601).

Ribes gracile Mx. Fl. i, 111 (1803).

Only a few bushes were found near Crumb's horse range, on the Dismal River, July 10 (No. 1523).

HALORRHAGIDACEÆ.

Myriophyllum spicatum L. Sp. Pl. ii, 992 (1753).

What I take as the typical form was collected in leaf only on a lake in Grant County, northwest of Whitman, September 19 (No. 1785). Another form having smaller leaves, with shorter, more or less fleshy lobes, was found in bloom in Swan Lake, 25 or 30 miles south of Whitman, August 7 (No. 1784).

Hippuris vulgaris L. Sp. Pl. i, 4 (1753).

This is new to the State. The only locality known is a swamp, near Haney Bros.' ranches, 25 miles south of Whitman; August 4 (No. 1645).

LYTHRACEÆ.

Lythrum alatum Pursh, Fl. i, 334 (1814).

Common in meadows: Plummer Ford, July 3; Forks of Dismal River, July 12 (No. 1468).

ONAGRACEÆ.

Epilobium lineare Muhl. Cat. 39 (1813).

In the western part of the region: Middle Fork of Middle Loup River, July 26; northeast of Whitman, July 31 (No. 1603).

Epilobium adenocaulon Hausk. Œst. Bot. Zeit. xxix, 119 (1879).

Along the banks of Middle Loup River, north of Mullen, July 16 to 19. No. 1556 is a more simple and broad-leafed form; No. 1576, a more branched and narrow-leafed form.

Circæa lutetiana L. Sp. Pl. i, 9 (1753).

Common in shaded, wet places: Plummer Ford, July 3; Forks of Dismal River, July 11 (No. 1463).

Œnothera biennis L. Sp. Pl. i, 346 (1753).

Common on the banks of the Middle Loup River at Mullen, July 17, 18; also in Grant County, July 31 (No. 1578). Grades into the next by several forms.

Œnothera biennis parviflora (L.) Torr. & Gr. Fl. i, 492 (1840); *Œ. parviflora* L. Sp. Pl. ed. 2, i, 492 (1762).

Flowers very small, of the size of the next species. Mullen, July 18; Middle Fork of Middle Loup River, July 26; South Dismal River, August 14 (No. 1573).

Œnothera sinuata L. Mant. ii, 228 (1767).

All my specimens are low, generally less than 1 dm. high, the leaves sinuately toothed or entire. This is the only form growing in Nebraska. Thedford, June 15 (No. 1302).

Œnothera rhombipetala Nutt.; Torr. & Gr. Fl. i, 493 (1840).

This is common on the sand hills near Plummer Ford; July 6 to 8 (No. 1510).

Œnothera albicaulis Pursh, Fl. ii, 733 (1814); *Œ. pinnatifida* Nutt. Gen. i, 245 (1818).

Œ. albicaulis of Fraser's Catalogue is a *nomen nudum*, and the first plant described under this name is the present, which Mr. Pursh inaccurately supposed to be identical with that of Fraser's Catalogue.

Rare in the region, only a few specimens secured at Mullen, July 15 (No. 1293).

Œnothera pallida Lindl. Bot. Reg. xiv, t. 1142 (1828); *Œ. albicaulis* Nutt. Gen. i, 245 (1818), not Pursh.

The common form in Nebraska has a tall, upright white stem and narrower, linear or linear-lanceolate, or linear-oblong leaves, with mostly entire margins. It generally grows on prairie soil. Mullen, July 19 (No. 1586).

Œnothera pallida latifolia var. nov.

Leaves broad, 6 to 9 cm. long and 2 to 3 cm. wide, remotely dentate, cinereous on both sides; stem diffuse and much branched.

It grows in sand draws and on the banks of rivers. Mullen, July 17; Grant County, August 4 (No. 1544). No. 112 of my western Nebraska collection is the same. In a species as variable as *Œ. pallida*, perhaps the number of varietal names should not be increased; but this is so remarkable and so different from the common form, that I feel justified in adding another name. It is true that there are some intermediate forms, as for instance No. 1843 of this collection (Mullen, July 17), but such forms are very rare. If no intermediate forms were found, we should call them distinct species.

Œnothera serrulata Nutt. Gen. i, 246 (1818).

A common plant throughout the region. Thedford, June 16; Plummer Ford, July 3 (No. 1303).

Gaura coccinea Pursh, Fl. ii, 733 (1814).

Rather common on the prairies. Thedford, June 17 (No. 1343).

Gaura parviflora Dougl.; Hook. Fl. Bor. Amer. i, 208 (1834).

Rare: only one poor specimen secured, at Plummer Ford, July 3 (No. 1460).

Gaura biennis L. Sp. Pl. i, 347 (1753).

Rare: on banks of Middle Loup River, above Seneca, September 16 (No. 1777).

LOASACEÆ.

Mentzelia nuda (Pursh) Torr. & Gr. Fl. i, 535 (1840); *Bartonia nuda* Pursh, Fl i, 328 (1814).

On a hill on the west side of South Dismal River, August 14 (No. 1689).

CACTACEÆ.

Cactus viviparus Nutt. Fraser's Cat. (1813).
Here and there in the sand hills around Thedford, June 20, etc., (No. 1379).

Opuntia humifusa Raf. Ann. Nat. 15 (1820); *O. rafinesquii* Engelm. Pac. R. Rep. iv, 41 (1856).
Common throughout the sand hills: Dismal River, June 26; Plummer Ford, July 6 and 8 (No. 1447).

Opuntia polyacantha Haw. Syn. Pl. Succ. Suppl. 82 (1819); *O. missouriensis* DC. Prodr. iii, 472 (1828).
Above Plummer Ford, July 5 (No. 1501)). A young stage with long, cylindrical, finger-like joints was collected near the Forks of Dismal River, July 11 (No. 1526).

UMBELLIFERÆ.

Sium cicutæfolium Gmelin, Syst. ii, 482 (1791).
In the lakes of Grant County, July 29 to 31; South Dismal River, August 14 (No. 1615).
New to Nebraska.

Berula erecta (Huds.) Coville, Contr. Nat. Herb. iv, 115 (1893); *Sium erectum* Huds. Fl. Angl. 103 (1762).
Common in and along Dismal River: Plummer Ford, July 5 (No. 1497); South Dismal River, August 4 (No. 1517).

Cicuta virosa maculata (L.) Coult. & Rose, Rev. Umb. 130 (1888); *Cicuta maculata* L. Sp. Pl. i, 256 (1753).
Common in the rivers: Plummer Ford, July 4; Mullen, July 17; Forks of Middle Loup River, July 26 (No. 1491).

Cicuta bulbifera L. Sp. Pl. i, 255 (1753).
In swampy places in Grant County, August 4 and September 20; Thedford, September 7 (No. 1737).

Sanicula canadensis L. Sp. Pl. i, 235 (1753).
In woods, near Plummer Ford, July 3 (No. 1462).

CORNACEÆ.

Cornus stolonifera Mx. Fl. i, 92 (1803).
Common along the streams: Dismal River, June 27; Plummer Ford, July 6; South Dismal River, August 14 (No. 1435); Norway, June 12; Plummer Ford, July 3; Forks of Dismal River, July 11 (No. 1414). The latter is a form with slightly smaller leaves and more wooly pubescence.

CAPRIFOLIACEÆ.

Symphoricarpos occidentalis Hook. Fl. Bor. Amer. i, 285 (1834).
Common on the prairies: Thedford, September 8; Dismal River, June 28 and July 3; Hooker County, July 17 and 27 (No. 1442).

RUBIACEÆ.

Galium trifidum L. Sp. Pl. i, 105 (1753).
A small form was collected in wet meadows at Norway, June 22; near Whitman, July 31 and September 20 (No. 1418). No. 1840 is a taller form, which is named *G. tinctorum* L. by A. A. Heller: Dismal River, June 26.

Galium trifidum latifolium Torr. Fl. U. S., 165 (1824).
In a wet meadow, near Whitman, July 31 (No. 1815).

Galium triflorum Mx. Fl. i, 80 (1803).
In wet meadows near the Forks of Dismal River, July 11 (No. 1519).

Galium aparine L. Sp. Pl. i, 108 (1753).
In a swampy place near Dismal River, July 27 (No. 1437).

COMPOSITÆ.

Kuhnia glutinosa Ell. Bot. S. Car. & Georg. ii, 292 (1824); *Kuhnia eupatorioides glutinosa* Hitchcock, Trans. St. Louis Acad. v, 498 (1891).
Sand hills, northeast of Whitman, August 1; Thedford, September 8 (No. 1636).

Lacinaria squarrosa (L.) Hill, Syst. Veg. iv, 49 (1762); *Serratula squarrosa* L. Sp. Pl. ii, 818 (1753).
The specimens from the sand hills have been placed with the variety *intermedia*, but I am inclined to believe that they belong to the species: Plummer Ford, July 6; Mullen, July 19; Middle Fork of Middle Loup River, July 26; Plummer Ford, August 23; north of Whitman, July 31 (1505).

Lacinaria punctata (Hook.) Kuntze, Rev. Gen. Pl. i, 349 (1891); *Liatris punctata* Hook. Fl. Bor. Amer. i, 306 (1834).
Also comparatively common: Plummer Ford, August 22; Thedford, September 13 (No. 1761). No. 1706 is a stunted form with broader leaves, collected on the railroad embankment near Thedford, August 19.

Eupatorium purpureum L. Sp. Pl. ii, 838 (1753).
Common along South Dismal River, August 12 (No. 1682).

Eupatorium perfoliatum L. Sp. Pl. ii, 838 (1753).
Together with the preceding, August 12 (No. 1683).

Grindelia squarrosa (Pursh) Dunal, in DC. Prodr. v, 315 (1836); *Donia squarrosa* Pursh, Fl. ii, 559 (1814).
Only a few stunted specimens were collected, 2 miles west of Thedford, September 12 (No. 1760).

Chrysopsis villosa (Pursh) Nutt. Gen. ii, 151 (1818); *Amellus villosus* Pursh, Fl. ii, 564 (1814).
Otto Kuntze and Mr. MacMillan have adopted Diplogon Raf., which was published earlier in the year 1818; but this name had been used before by Poiret for Diplopogon.
This plant is very variable, and two of my forms might have as good right to varietal names as others already described. Specimens of a more typical form were collected: 3 miles northeast of Whitman, July 31; Cody's Lakes, August 9 to 12; Thedford, August 24 and September 11 (No. 1633).
A form with oblong, nearly glabrous or slightly scabrous, thin leaves with setose-ciliate margins was found near Whitman, September 19 (No. 1781).
Another similar form having linear-lanceolate leaves with revolute margins was found near Mullen, September 14 (No. 1766).

Solidago missouriensis Nutt. Journ. Acad. Phila. vii, 32 (1834).
The original *S. missouriensis* is the low form with a short, crowded panicle, which was named by Gray variety *montana*. It was collected at Thedford, September 11 (No. 1750). The taller form with more spreading panicle, the *S. missouriensis* of Gray's Synoptical Flora, should have the name *S. missouriensis glaberrima*[1] if held as a distinct variety. The great variation in the species of *Solidago* is well known. If this variety is admitted, I am afraid that, in order to be consistent, we should be obliged to add one or two varieties to nearly every one of the species in that genus: Plummer Ford, August 23; northeast of Whitman, July 31 (No. 1632).

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[1] *S. glaberrima* Martens, Bull. Acad. Brux. viii, 68, 1841.

Solidago serotina Ait. Hort. Kew. iii, 211 (1789), not Willd.

Here and there, in copses: Haney's ranch, August 5; Cody's Lakes, August 10; South Dismal River, August 12 (No. 1648).

Solidago canadensis L. Sp. Pl. ii, 878 (1753).

A hirsute form approaching the varieties *scabra* and *procera* of Torrey & Gray: Thedford, September 12; Mullen, September 14 (No. 1757).

Solidago canadensis gilvocanescens var. nov.

Low, 3 to 4 dm. high; leafy; leaves 3 to 6 cm. long, oblanceolate to lanceolate, remotely serrate above the middle or entire; the whole plant finely puberulent-canescent and of a yellowish hue, often somewhat scabrous; inflorescence dense, contracted, with short recurved branches; heads smaller than in *S. canadensis*.

It resembles somewhat the varieties *canescens* and *arizonica* in the pubescence, but differs from both in being much lower and more leafy. The leaves resemble somewhat those of the latter, but the bracts are very different. It was growing in sandy soil near water, Cody's Lakes, Hooker County, Nebr. (No. 1662). Specimens of this variety are preserved in the National Herbarium, from the following localities: Dodge City, Kans., August 19, 1890, B. B. Smyth, No. 162; Montana (locality not given), L. F. Ward (this is labeled *S. nemoralis*). No. 34 of Nicollet's Northwestern Expedition, labeled *S. incana β.* (?) Torr. & Gr., collected July 25, 1839, on saline, swampy margins of the Lake of the Woods near Devil's Lake, Minn., is a form with narrower leaves.

Solidago nemoralis Ait. Hort. Kew. iii, 213 (1789).

Two forms were collected. One is about 6 to 8 dm. high with an open panicle, resembling somewhat a large form of *S. canadensis;* evidently scabrous: Thedford, September 8; Cody's Lakes, August 9 to 12 (No. 1663).

The other form is lower, 4 to 6 dm. high, with a narrow, nearly spicate panicle: Thedford, September 8 (No. 1751).

Solidago mollis Bartl. Ind. Sem. Gœtt. 5 (1836); *Solidago incana* Torr. & Gr. Fl. ii, 221 (1841); *S. nemoralis incana* Gray, Proc. Amer. Acad. xvii, 197 (1882).

This is a good species, and perfectly distinct as well from *S. nemoralis* as from *S. radula,* to which it has been referred.

My plant is low, 2 to 3 dm. high, very leafy; leaves thick, triple-nerved, diminishing upward; the lower 5 to 7 cm. long and 2 to 3 cm. wide, obovate, coarsely and remotely serrate scabrous and somewhat canescent; panicle short, of short recurved branches; heads larger and with broader bracts than in *S. californica,* lower forms of which it resembles. Specimens in the National Herbarium collected by Orcutt (No. 89, partly) in California and by C. G. Pringle, at Tehachipi Pass, California, resemble this in growth, but have the pubescence of *S. californica.* The specimens in the National Herbarium are as follows: Whipple Expedition, Antelope Hill, on the Canadian River; S. M. Rothammer, No. 488, Upper Missouri; two sheets collected by L. F. Ward, in Montana, 1883; two sheets by Dr. Wilcox, Nebraska, 1887; P. A. Rydberg, No. 157, western Nebraska, 1891. A specimen, collected by Dr. Palmer in Arizona, 1869, has no name. Near the railroad, Mullen, September 18 (No. 1770).

Solidago rigida L. Sp. Pl. ii, 880 (1753).

West Cody's Lake, August 10; Plummer Ford, August 22 (1666).

Euthamia graminifolia (L.) Nutt. Gen. ii, 162 (1818); *Chrysocoma graminifolia* L. Sp. Pl. ii, 841 (1753); *Solidago lanceolata* L. Mant. 114 (1767).

Thedford, September 8 (No. 1738).

Eriocarpum spinulosum (Pursh) Greene, Erythea, ii, 108 (1894); *Amellus spinulosus* Pursh, Fl. ii, 564 (1814).

Throughout the sand hills, but local: Thedford, June 19, August 9; Dismal River, June 27; Plummer Ford, July 4 to 8; Mullen, July 26 (No. 1403).

Aster novæ-angliæ L. Sp. Pl. ii, 875 (1753).

I found specimens with red as well as with blue rays, but do not think this difference in color should make it a variety: Thedford, September 7; Halsey, September 11 (No. 1735).

Aster oblongifolius Nutt. Gen. ii, 156 (1818).

Not common: Grant County, near Whitman, September 19 (No. 1780).

Aster oblongifolius rigidus Gray, Syn. Fl. i, pt ii, 179 (1886).

More common than the species. On the sand hills and dry prairies: Thedford, September 9 (No. 1743).

Aster multiflorus Ait. Hort. Kew. iii, 203 (1789).

Dry prairies: Thedford, August 26, September 9 (No. 1731).

Aster multiflorus stricticaulis Torr. & Gr. Fl. ii, 125 (1841).

Rare: meadow at Thedford, September 9 (No. 1752).

Aster multiflorus incano-pilosus (Lindl.) nom. nov; *Aster ramulosus incano-pilosus* Lindl.; Hook. Fl. Bor. Amer. ii, 13 (1834).

This is *A. commutatus* Gray.[1] I believe, however, that it should be regarded as a variety of *A. multiflorus*, as it is very hard to draw a line between the two. Mullen, September 14 (No. 1765). Specimens with blue rays were collected at Halsey, September 11 (No. 1754).

Aster salicifolius Lam. Encycl. i, 306 (1783).

This seems to have a little larger head than usual, resembling somewhat *A. longifolius*. The bracts are narrow, thin, acute, but with a broader green tip. Meadows: Thedford, September 7; Whitman, September 19 (No. 1739).

Aster salicifolius subasper (Lindl.) Gray, Syn. Fl. i, pt. ii, 188 (1884); *Aster subasper* Lindl. Hook. Comp. Bot. Mag. i, 97 (1835).

I refer two asters growing commonly along the streams to this species, although with some doubt. They both differ from the common form of *A. salicifolius* in having larger heads, pubescent stem, and much elongated foliaceous bracts. The latter character led me to believe at first that they belonged to *A. foliaceus* Lindl. Comparing them with the collection of forms in the National Herbarium I found that they are not related to that species. One form has the leaves of the typical *A. paniculatus*. This was collected at Thedford, September 7, and near Whitman, September 18 (No. 1739). The other has shorter, more or less oval, thicker leaves. Plummer Ford, August 22.

Aster junceus Ait. Hort. Kew. iii, 204 (1789).

My plant is like Minnesota specimens in the National Herbarium under this name. It seems, however, to have narrower leaves than usual. The bracts have also broader, more or less purplish tips. It resembles somewhat a simple, narrow-leafed *A. tradescanti*, but the heads are larger. It also comes near *A. ericoides pringlei* Gray, from which it is distinguished by the broader bracts. In wet meadows, near Thedford, August 9 (No. 1701).

The same form was collected by me in the Black Hills of South Dakota in 1892.

Aster umbellatus pubens Gray, Syn. Fl. i, pt. ii, 197 (1884).

On the banks of Middle Loup River, Halsey, September 11 (No. 1748). This has not been reported for Nebraska before.

Aster canescens Pursh, Fl. ii, 547 (1814), var.

A very tall form with many large, subracemose heads and broad, glabrous, dentate leaves; otherwise like the next. Plummer Ford, August 23 (No. 1721).

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[1] Syn. Fl. i, pt. ii, 185 (1884).

Aster canescens viscosus Gray, Syn. Fl. i, pt. ii, 206 (1884); *Dieteria viscosa* Nutt. Trans. Amer. Phil. Soc. vii, 300 (1841).

Gray cites *Diplopappus incanus*[1] as a synonym, but to me this seems to be something else. Mullen, September 18 (No. 1834).

Erigeron bellidiastrum Nutt. Trans. Amer. Phil. Soc. n. ser. vii, 307 (1841).

Smaller forms of this can not be separated from *E. divergens*, except by the achenes. In *E. bellidiastrum* these are truncate, tipped with a whitened disk, which bears a simple pappus. The pappus of *E. divergens* is double, the outer of squamellate, short bristles. On rich soil, especially among bushes, it becomes 6 to 8 dm. high, with larger leaves and heads: Thedford, June 17; Forks of Middle Loup River, July 26; Dismal River, June 27 (No. 1350). On poorer soil it becomes lower, 1 to 3 dm. high, more grayish, and with smaller heads and leaves. This form has been mistaken for *E. divergens:* Forks of Dismal River, July 11 (No. 1536).

Erigeron ramosus beyrichii (Fisch. & Mey.) Smith & Pound, Bot. Surv. Nebr. ii, 11 (1893); *Stenactis beyrichii* Fisch. & Mey., Ind. Sem. Petrop. v, 27 (1838).

This is the common form of *E. ramosum* (Walt.) B. S. P., in the central and western parts of Nebraska: Plummer Ford, July 3; Dismal River, July 11 (No. 1451).

Erigeron canadensis L. Sp. Pl. ii, 863 (1753).

This is a very variable plant. The height varies from 2 m. down to a few cm. The taller and simpler, or more typical form, was collected on the South Dismal, August 12 (No. 1678). In a prairie-dog town near Thedford all specimens were low, much branched from the base and very diffuse. These could not be distinguished from *E. divaricatus* except by their slightly broader leaves, the more racemosely disposed panicle, and the white rays: August 19 and September 8 (No. 1699).

Antennaria plantaginifolia (L.) Richards. Bot. App. ed. 2, 30 (1823); *Gnaphalium plantaginifolium* L. Sp. Pl. ii, 850 (1753).

This is the common Antennaria of the plains extending into the Black Hills of South Dakota and the Rocky Mountains. The general habit is that of *A. dioica* except that the stolons are short, but the heads are more like those of *A. plantaginifolia*. The leaves are spatulate, 3 to 4 cm. long, 1-nerved or indistinctly 3-nerved; heads about 1 cm. high; bracts of the sterile heads broad and obtuse; those of the fertile ones narrow, acute or obtuse, in both the base light-brown with a papery portion, constituting more than half the length of the scale. All western forms I have seen which were labeled *A. plantaginifolia* belong here, so also a few labeled *A. dioica*. It never has those large thin leaves which characterize the eastern *A. plantaginifolia*. It is common in Nebraska and the Black Hills, but rare in the sand-hill region: Thedford, June 15 (No. 1292).

Iva xanthifolia Nutt. Gen. ii, 185 (1818).

In old fields: Thedford, September 7; near Whitman, September 19 (No. 1740).

In brackish soil near a dry lake, in Grant County, I found a low form with small leaves, 3 to 5 cm. long, entire or 3-lobed, oblong to ovate, more green beneath; with more rounded teeth than in the typical form, and with the heads more or less crowded together in glomerules: September 19 (No. 1783).

Ambrosia artemisiæfolia L. Sp. Pl. ii, 988 (1753).

Not common in the region: West Cody's Lake, August 10; Thedford, September 11 (No. 1667).

Ambrosia psilostachya DC. Prodr. v, 526 (1836).

As the preceding, very variable. When young, they are very hard to distinguish from each other. *A. psilostachya* is very common throughout the region: East Cody's Lake, August 10; Plummer Ford, August 22; Grant County, near Whitman, August

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[1] Lindl. Bot. Reg. t. 1693.

(No. 1668). A stout, very hairy and strigose form was collected near West Cody's Lake, August 10 (No. 1824).

Xanthium canadense Mill. Gard. Dict. ed. 8, no. 2 (1768).

Not common: Cody's Lakes, August 9; 3 miles northwest of Whitman, September 19 (No. 1675).

Rudbeckia hirta L. Sp. Pl. ii, 907 (1753).

Plummer Ford, July 3; Mullen, July 18 (No. 1470).

Lepachys columnaris (Pursh) Torr. & Gr. Fl. ii, 315 (1842); *Rudbeckia columnaris* Pursh, Fl. ii, 575 (1814).

Thedford, June 21; Dismal River, June 27; Plummer Ford, July 3 (No. 1395).

The form known as variety *pulcherrima*[1] was collected near Dismal River, June 28; Mullen, July 17 (No. 1445).

Helianthus annuus L. Sp. Pl. ii, 904 (1753).

Not common, its place in the region being mostly taken by the next: banks of South Dismal River, August 12 (No. 1676).

Helianthus petiolaris Nutt. Journ. Acad. Phila. ii, 115 (1821).

In the typical form, the leaves are small, ovate and cuneate at the base. Common: Thedford, June 19; Grant County, near Whitman, August 3; Mullen, July 22 (No. 1362).

Helianthus petiolaris patens (Lehm.) Rydberg, Bull. Torr. Club, v, 334 (1894); *Helianthus patens* Lehm. Ind. Sem. Hamb. 1821, ex DC. Prodr. v, 556 (1836).

My specimens agree fully with the description of *H. patens* as given in DC. Prodr., but I believe it should be placed as a variety of *H. petiolaris*. It differs, however, considerably from the typical form, approaching in many respects *H. annuus*. The heads are as large as a middle sized *H. annuus*, but with the bracts of *H. petiolaris*. They are borne on long peduncles, which are more or less fleshy just below the head. The leaves are large, broadly ovate or subcordate as in *H. annuus*, but with longer petioles. In a fire-break, 3 miles northeast of Whitman, August 1 (No. 1635).

Helianthus scaberrimus Ell. Bot. S. Car. & Georg. 423 (1824); *H. rigidus* Desf. Cat. Hort. Paris, ed. 3, 184 (1829).

Gray cites *Helianthus diffusus* Sims,[2] also as a synonym of *H. rigidus* (Cass.) Desf. Although the description fits approximately, the plate seems so different from our *H. rigidus* that it must be something else. As this plant takes the name *H. scaberrimus* Ell., *H. scaberrimus* Benth.[3] must take the name *H. bolanderi* Gray.[4]

Sand hills, 3 miles northeast of Whitman, July 29 to 31 (No. 1627).

Helianthus sp.

The head is not unlike those of *H. grosse-serratus* and *H. maximiliani*, but the leaves are very thin, on slender, margined ciliolate petioles. Only one specimen in bloom secured; near Cody's Lakes, August 10 (No. 1825).

Helianthus giganteus L. Sp. Pl. ii, 905 (1753).

Only a few specimens belonging to this species were secured: near West Cody's Lake, August 10 (No. 1669).

Helianthus maximiliani Schrad. Ind. Sem. Hort. Gœtt. (1835).

The specimens differ somewhat from the common form in that the stem is unusually smooth and shining: West Cody's Lake, August 10; Halsey, September 11; Thedford, August 19 (No. 1673). Another form was seen frequently throughout Grant County. It must belong to the species, although the leaves were all opposite. The bracts of the involucre were very broad, undoubtedly monstrous, this growth

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[1] Torr. & Gr. Fl. i, 315 (1838).

[2] Bot. Mag. xlv, t. 2020 (1818).

[3] Bot. Sulph. 28 (1844).

[4] Proc. Amer. Acad. vi, 544 (1865).

very likely due to the action of the insects. The plants were generally only 2 to 3 dm. high. Collected 15 miles south of Whitman, August 3 (No. 1640).

Helianthus grosse-serratus Martens, Sel. Sem. Hort. Lovan, 1839.

The leaves of my specimens are shorter and less coarsely serrate than usual: Mullen, September 14 (No. 1767).

Bidens lævis (L.) B. S. P. Cat. Pl. N. Y. 29 (1888); *Helianthus lævis* L. Sp. Pl. ii, 906 (1753).

I have been in doubt whether to place our Nebraska specimens with *B. lævis* or with *B. cernua*. The heads are little nodding if at all, but the rays are much shorter than in the true *B. lævis* and the outer bracts often longer than the heads. Common: Mullen, August 17; Thedford, August 26 (No. 1696).

Bidens frondosa L. Sp. Pl. ii, 832 (1753).

Thedford, August 19 and 26; Halsey, September 11 (No. 1707).

Bidens trichosperma tenuiloba (Gray) Britton, Bull. Torr. Club, xx, 281 (1893); *Coreopsis trichosperma tenuiloba* Gray, Syn. Fl. i, pt. ii, 295 (1884).

Some specimens not yet in bloom, with broader lobes, were collected in Grant County, August 3. These may be the true *Bidens trichosperma* or, perhaps, *B. involucrata*. Thedford, August 19 to 26; Cody's Lakes, August 10 (No. 1642).

Thelesperma gracile (Torr.) Gray, Kew Journ. Bot. i, 252 (1849); *Bidens gracilis* Torr. Ann. Lyc. N. Y. ii, 215 (1828).

On the sand hills: near Dismal River, July 28; Plummer Ford, July 3; Mullen, July 17 to 24 (No. 1444).

Hymenopappus filifolius Hook. Fl. Bor. Amer. i, 317 (1834).

This appears to be the original *H. filifolius* of Hooker. Gray includes also *H. luteus* Nutt. in this species, which I think makes it a very complex one. Then *H. tenuifolius* could, with perhaps equal right, be included also. Our specimens have always yellow flowers and are scarcely scapose. Mullen, July 17; 20 miles south of Whitman, August 5 (No. 1554). No. 1321 is a more leafy form with larger, more or less corymbose heads. Thedford, June 16; Mullen, July 17; Plummer Ford, July 8; Dismal River, June 27.

Helenium autumnale L. Sp. Pl. ii, 886 (1753).

Common: along the South Dismal River, August 14; Plummer Ford, August 22 (No. 1690).

Artemisia biennis Willd. Phytogr. 11 (1794).

All my specimens are weak and bright green, and seem to be annual. In dry lakes northwest of Whitman, September 19 (No. 1779).

Artemisia frigida Willd. Sp. Pl. iii, 1838 (1803).

On a dry hill, south of Thedford, August 8 (No. 1733).

Artemisia canadensis Mx. Fl. ii, 128 (1803).

Sandy prairie, Thedford, August 26 and September 8 (No. 1730).

Artemisia gnaphalodes Nutt. Gen. ii, 143 (1818).

The relationship between this and *A. ludoviciana* of Nuttall is a little obscure, but as *A. gnaphalodes* appears first on the page in the Genera, it must be regarded as the species, and must retain its name, even if the two are regarded as one species. Thedford, August 26 (No. 1725).

Senecio compactus (Gray) Rydberg, Bull. Torr. Club, v, 312 (1894); *Senecio aureus compactus* Gray, Syn. Fl. i, pt. ii, 391 (1884).

My specimens differ in having a more open cyme of fewer heads. The narrow, fleshy, and stiff leaves, toothed only at the apex, present a conspicuous character, which makes it, I believe, deserving of specific rank. Sand hills: Thedford, June 15, 16, and 19 (No. 1311).

CARDUUS PLATTENSIS Rydberg.

Senecio douglassii DC. Prodr. vi, 429 (1837).

In the sand hills: South Dismal River, August 12; Plummer Ford, August 23; northwest of Whitman, September 19 (No. 1677).

Carduus altissimus L. Sp. Pl. ii, 824 (1753).

Not very common, though abundant in eastern Nebraska. South Dismal River, August 12 (No. 1685). No. 1724 is a form approaching the variety *discolor* (Muhl.) Gray, Syn. Fl. i, pt. ii, 404 (1884). Plummer Ford, August 22.

Carduus plattensis sp. nov.; *Cnicus hookerianus* var., Gray Pac. R. Rep. xxi, 45, and *Cnicus pitcheri* Gray, Syn. Fl. i, pt. ii, 403, as to Suckley's Dakota plant.

Generally 5 to 7 dm. high, white-tomentose especially on the lower surface of the leaves; the lower leaves 2 dm. long, deeply pinnately divided into oblong divisions 3 to 5 cm. long and 0.5 to 1 cm. wide, tipped with a slender, short spine and sparingly spinosely toothed; the upper shorter and more spinose; head hemispherical, about 4 to 5 cm. high; bracts ovate-lanceolate, the outer very thick and dark from the broad glandular spot, tipped with a weak, spreading, more or less triangular-flattened spine; the inner narrower, spineless, with a more or less elongated, erose tip or appendage; corollas apparently always ochroleucous, limb obliquely divided into long, linear lobes. (Plate I.)

The head is much like that of *C. pitcheri,* but the inner bracts have more tendency to be elongated and erose. The main difference is in the leaves, the lobes of which in *C. plattensis* are scarcely half as long but more than twice as wide as in *C. pitcheri.* From *C. undulatus,* it differs in the broader heads, the ochroleucous flowers, the form of the bracts, especially the inner ones, the deep-orange taproot and, in the typical form,[1] the less spiny leaves, the lobes of which have a tendency to be more rounded at the end and cuspidately spinose-tipped.

In the Gray Herbarium, there is only one specimen, viz, that of Suckley from "L'Eau qui Court," Dakota. Undoubtedly Dr. Gray saw the difference between this and *C. pitcheri,* but did not think it advisable to describe it as new from a single specimen.

C. plattensis is common in the sand-hill region of Nebraska. The following specimens are in the Herbarium of the University of Nebraska:

No. 213, Rydberg, Kearney County, Nebr., June 15, 1891, and Scott's Bluff County, July 24, 1891; No. 64 (in part), J. G. Smith and Roscoe Pound, Boxbutte County, Nebr., July 7, 1892, and the specimens of this collection, No. 1356, Thedford, June 17, and Plummer Ford, July 5. (Type specimen from which the plate is drawn is from the latter place and preserved in my own herbarium.)

Lygodesmia juncea (Pursh) Don, Edinb. N. Phil. Journ. January–March, 1829, 311; *Prenanthes juncea* Pursh, Fl. ii, 498 (1814).

Dismal River, June 27; Mullen, July 17 (No. 1432).

Lygodesmia rostrata (Gray) Gray, Proc. Amer. Acad. ix, 217 (1874); *L. juncea rostrata* Gray, Proc. Acad. Phila. 1863, 69 (1863).

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[1] A form evidently belonging to the same species, but of somewhat different habit, is also growing in Nebraska. It may be known as variety *spinosior.* It is like the species, but the lobes of the leaves are short, broad, and more spiny, resembling somewhat those of *C. undulatus,* the heads generally smaller and the bracts darker.

Two specimens of this form are in the Gray Herbarium: one with larger heads, No. 73, Fendler, collected near Fort Kearney, July, 1849, is referred to *Cnicus undulatus;* the other with smaller heads, collected in the sand hills of the Upper Platte by Dr. Hayden, is placed with *Cn. undulatus canescens.* It is, however, scarcely *Cirsium canescens* Nutt., as the root is not "creeping as in *arvense*" nor are the flowers "pale rose."

In the Herbarium of the University of Nebraska, there are two specimens, both from the State: No. 64 (in part), J. G. Smith and Roscoe Pound, Boxbutte County, July 7, 1892; No. 2964, Fred Clements, Paddock, Holt County, July 25, 1893.

The pappus is white or sordid, finely papillose under the lens, which makes the distinction between Lygodesmia and Stephanomeria still smaller. Perhaps the two should make one genus. Dismal River, June 27; Mullen, July 17 (No. 1584).

Nothocalais cuspidata (Pursh) Greene, Bull. Cal. Acad., ser. 2, ii, 55 (1886); *Troximon cuspidatum* Pursh, Fl. ii, 742 (1814).

Only four small specimens in fruit, found west of Thedford, June 14 (No. 1252).

Lactuca canadensis L. Sp. Pl. ii, 796 (1753).

Few of the upper leaves are pinnatifid and the panicle is sometimes more open. Plummer Ford, August 23; Thedford, September 12 (No. 1755).

Lactuca ludoviciana (Nutt.) DC. Prodr. vii, 141 (1839); *Sonchus ludovicianus* Nutt. Gen. ii, 125 (1818).

River bank, near Mullen, July 17 (No. 1555). A lower purplish form was growing on the hillsides, near Plummer Ford: July 6 (No. 1507).

Lactuca pulchella (Pursh) DC. Prodr. vii, 134 (1839); *Sonchus pulchellus* Pursh, Fl. ii, 502 (1814).

Mullen, July 18; northeast of Whitman, August 2 (No. 1570).

CAMPANULACEÆ.

Lobelia syphilitica L. Sp. Pl. ii, 931 (1753).

Not uncommon on South Dismal River, August 9 to 14 (No. 1680).

Lobelia spicata hirtella Gray, Syn. Fl. ii, pt. i, 6 (1878).

Rare: in a meadow 4 miles northeast of Whitman, August 1; Thedford, August 26 (No. 1818).

Legouzia perfoliata (L.) Britton, Mem. Torr. Club, v, 309 (1894); *Campanula perfoliata* L. Sp. Pl. i, 169 (1753).

Legouzia Dur. is the oldest generic name that can be used, *Pentagonia* Sieg., *Speculum* Hall, and *Specularia* Heist. being older than 1753 and, as far as I have been able to find, not used between that date and 1782. On hillsides here and there: Thedford, June 17; Dismal River, June 29 (No. 1346).

Campanula aparinoides Pursh, Fl. i, 159 (1814).

Common in wet meadows throughout the region: Plummer Ford, July 3 and 4; West Cody's Lake, August 10 (No. 1457).

PRIMULACEÆ.

Androsace occidentalis Pursh, Fl. i, 137 (1814).

Only three small specimens collected in a prairie-dog town southeast of Thedford, June 15 (1299).

Naumburgia thyrsiflora (L.) Duby, in DC. Prodr. viii, 60 (1844); *Lysimachia thyrsiflora* L. Sp. Pl. i, 147 (1753).

The flowers in my specimens are smaller than usual, and the teeth between the lobes of the corolla are obsolete. The leaves of all the specimens found near Thedford seemed to be hairy beneath. The apparent hairs, however, were probably a parasitic alga. Middle Loup River, near Thedford, June 14 to 16; 3 miles northeast of Whitman, July 29 (No. 1262).

OLEACEÆ.

Fraxinus pennsylvanica Marsh. Arb. Amer. 51 (1785).

This seems to grade directly into the next. Thedford, June 21 (No. 1839).

Fraxinus pennsylvanica lanceolata (Borckhausen) Sargent, Silva Amer. vi, 50 (1894); *Fraxinus lanceolata* Borck. Handb. Forstbot. i, 826 (1800).

This has been regarded as a distinct species under the name of *Fraxinus viridis* Mx., but seems not to be different from the preceding except in the lack of the pubescence on the young shoots. Both are found here and there on the hillsides, but no large trees were seen. Seneca, September 9; Dismal River, July 3 (No. 1391). A few young trees were found on the South Dismal River, that had very large leaflets.

APOCYNACEÆ.

Apocynum cannabinum L. Sp. Pl. i, 213 (1753).

The specimens from Thedford and Natick are low and with smaller leaves than usual. Thedford, June 17; Natick, June 20; Norway, June 22; northeast of Whitman, August 1 (No. 1353).

ASCLEPIADACEÆ.

Asclepias incarnata L. Sp. Pl. i, 215 (1753).

Common in the meadows: Forks of Dismal River, July 11; Middle Loup, Mullen, July 17; South Dismal River, August 14; Thedford, September 7 (No. 1518).

Asclepias speciosa Torr. Ann. Lyc. N. Y. ii, 218 (1834).

Throughout the region, but local. Railroad embankments, Thedford, June 21; Dismal River, June 28 and 29 (No. 1383).

Asclepias syriaca L. Sp. Pl. ed. 2, i, 313 (1762).

Rare: Forks of Dismal River, July 12; Middle Loup River, Mullen, July 19 (No. 1532).

Asclepias arenaria Torr. Bot. Mex. Bound. 162 (1859).

This is very common in the sand hills around Dismal River, but only a few specimens in bloom were secured. Plummer Ford, July 5; South Dismal River, August 14 (No. 1500).

Asclepias verticillata pumila Gray, Proc. Amer. Acad. xii, 71 (1876).

In a prairie-dog town, Thedford, August 9 (No. 1700).

Acerates angustifolia (Nutt.) Dec. in DC. Prodr. viii, 522 (1844); *Polyotus angustifolius* Nutt. Trans. Amer. Phil. Soc. ser. 2, v, 201 (1833–37).

Mr. J. M. Holzinger unites *Asclepias stenophylla* with *Acerates auriculata*. In Nebraska they seem to be different in certain points. *Asclepias stenophylla* Gray, which is the same as *Acerates angustifolia* (Nutt.) DC., usually has several stems from each root; these stems are more or less ascending and more or less hairy or pruinose; the divisions of the hood are yellowish-white and narrow. In *Acerates auriculata* the stem is single from the root, perfectly smooth and even, with a bloom; the divisions of the hood orange-yellow and broad. Evidently they are very nearly related and they perhaps grade into each other, though I have not found them to do so in Nebraska. They should, however, belong to the same genus, and to Acerates rather than to Asclepias. *Acerates auriculata* grows on the table-land; *A. angustifolia* in the sand hills. This may account for the difference. Norway, June 23; Plummer Ford, July 3 to 6 (No. 1420).

Acerates languinosa (Nutt.) Dec. in DC. Prodr. viii, 523 (1844); *Asclepias lanuginosa* Nutt. Gen. i, 168 (1818).

Sand hills, Thedford, June 16, 17, and 19 (No. 1326).

Acerates viridiflora (Raf.) Ell. Bot. S. Car. & Georg. 317 (1823);[1] *Asclepias viridiflora* Raf. Med. Rep. xi, 360 (1808).

Very variable. Generally two varieties have been acknowledged, but they grade into the typical form and into each other. They should be regarded as forms rather than varieties. The typical form was collected at Norway, June 22 (No. 1424). The

[1] The name is not given by Elliott, but he suggests that this species also may be included in Acerates.

form known as variety *lanceolata*[1] was more common. Thedford, June 15; Norway, June 23; Plummer Ford, July 3. (No. 1305).

The form corresponding to variety *linearis*[2] was collected at Norway, June 23; Plummer Ford, July 3 (No. 1423).

GENTIANACEÆ.

Gentiana andrewsii Griseb. in Hook. Fl. Bor. Amer. ii, 55 (1838).

Not uncommon in the meadows: Thedford, September 7; Mullen, September 16 (No. 1736).

POLEMONIACEÆ.

Collomia linearis Nutt. Gen. i, 126 (1818).

In fruit only: Plummer Ford, July 5 (No. 1502).

Gilia longiflora (Torr.) Don, Gard. Dict. iv, 245 (1838); *Cantua longiflora* Torr. Ann. Lyc. N. Y. ii, 221 (1827).

Professor Greene separates *Gilia* and *Navarretia*. If they should constitute only one genus, the name becomes *Navarretia longifolia*.[3] Forks of Middle Loup River, July 27; Plummer Ford, August 23; south of Whitman, August 3; Cody's Lakes, August 11 (No. 1605).

HYDROPHYLLACEÆ.

Macrocalyx nyctelea (L.) Kuntze, Rev. Gen. Pl. ii, 434 (1891); *Ipomœa nyctelea* L. Sp. Pl. i, 160 (1753).

Only four small specimens in fruit were collected in a prairie-dog town near Thedford, June 15 (No. 1301).

BORAGINACEÆ.

Lappula redowskii occidentalis (Wats.) nom. nov.; *Echinospermum redowskii occidentalis* Wats. Bot. King Surv. 246 (1871).

Professor MacMillan[4] has *Lappula redowskii pilosa;* but this should not be used, as Nuttall's *Cynoglossum pilosum*[5] is simply a misidentification. Nuttall mistook our plant for *C. pilosum* of Ruiz & Pavon.[6] Sandy soil: Thedford, June 14; Plummer Ford, July 3 (No. 1259).

Lappula deflexa americana (Gray) Greene, Pittonia, ii, 183 (1891); *Echinospermum deflexum americanum* Gray, Proc. Amer. Acad., xvii, 224 (1882).

The American form is quite different from the European.

Nebraska specimens have much broader and shorter leaves than the usual form. Rare: Plummer Ford, August 22 (No. 1475).

Cryptanthe crassisepala (Torr. & Gr.) Greene, Pittonia, i, 112 (1887); *Eritrichium crassisepalum* Torr. & Gr. Pac. R. Rep. ii, 171 (1854).

Prairie-dog towns: Thedford, June 20; Dismal River, June 27 (No. 1307).

Cryptanthe fendleri (Gray) Greene, Pittonia, i, 120 (1887); *Krynitzkia fendleri* Gray, Proc. Amer. Acad. xx, 268 (1885).

Prairie near Dismal River, June 27 (No. 1429).

Oreocarya suffruticosa (Torr.) Greene, Pittonia, i, 57 (1887); *Myosotis suffruticosa* Torr. Ann. Lyc. N. Y. ii, 225 (1827).

Prairies: Plummer Ford, July 8; Forks of Dismal River, July 11 (No. 1514).

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[1](Ives) Gray, Syn. Fl. ii, pt. i, 99 (1878); *A. lanceolata* Ives, Amer. Journ. Sci. i, 252 (1819).

[2]Gray, Syn. Fl. ii, pt. i, 99 (1878).

[3](Torr.) Kuntze, Rev. Gen. Pl. ii, 433 (1891).

[4]Metasp. Minn. Val. 441, 1892.

[5]Gen. i, 114 (1818).

[6]Fl. Peruv. ii, 6 (1799).

Lithospermum angustifolium Mx. Fl. i, 130 (1803).
Collected in fruit only, near Thedford, June 20 (No. 1389).

Lithospermum gmelini (Mx.) Hitchcock, Spring Fl. Manhattan, 30 (1894); *Batschia gmelini* Mx. Fl. i, 130 (1803).
This is a true sand-hill species. Thedford, June 15 (No. 1355).

Onosmodium molle Mx. Fl. i, 133 (1803).
If this and *O. carolinianum* are to be united as one species, as they very probably should be, *O. molle* is the older name, and the form it represents should be regarded as the type. Thedford, June 20 (No. 1365).

CONVOLVULACEÆ.

Ipomœa leptophylla Torr. Pl. Frem. 94 (1853).
On the prairies near Plummer Ford, July 8 (No. 1511).

Cuscuta indecora pulcherrima (Scheele) Engelm. Trans. St. Louis Acad. i, No. 3, 502 (1859); *C. pulcherrima* Scheele, Linnæa xxi, 750 (1848).
The most common Cuscuta in the region: northeast of Whitman, August 1, host plants, *Helianthus petiolaris, Rumex venosus;* South Dismal River, August 14, host, *Helianthus petiolaris;* Mullen, September 19, hosts, *Cycloloma atriplicifolia, Chenopodium leptophyllum, Corispermum hyssopifolium,* and *Polygonum ramosissimum* (No. 1634). In a few specimens the corolla is smaller and the plant approaches the true *C. indecora.* Mullen, August 17; hosts, *Psoralea lanceolata* and *Artemisia canadensis;* Thedford, August 19, host, *Lotus americanus* (No. 1694).

Cuscuta coryli Engelm. Amer. Journ. Sci. xliii, 337 (1842).
More rare: South Dismal River, August 14; host, *Salix cordata angustifolia.* Thedford, August 26, host, Aster sp. (No. 1688).

Cuscuta cuspidata Engelm. Bost. Journ. Nat. Hist. v, 224 (1845).
Collected only at a point 4 miles northeast of Whitman, August 1; host, *Ambrosia psilostachya* (No. 1639).

SOLANACEÆ.

Solanum nigrum L. Sp. Pl. i, 136 (1753).
The specimens from Mullen, July 20, are tall, hairy, with the younger parts subcanescent. Those from Thedford, June 21, are greener and with thin leaves (No. 1385).

Solanum triflorum Nutt. Gen. i, 128 (1818).
The only places in which I have seen this plant growing are prairie-dog towns (see note, page 141). Thedford, June 21, August 19 (No. 1393).

Solanum rostratum Dunal, Sol. 234 (1816).
Rare in the region; I collected only one specimen and Mr. Tulen only a few: Thedford, September 12 (No. 1758).

Physalis heterophylla Nees, Linnæa, vi, 463 (1831); *Physalis virginiana* American authors, not Mill. Dict. ed. 8, No. 4 (1768).
Under this I place several different forms. They appear to belong to one species, very probably the one named, but they differ somewhat from the form found in eastern Nebraska. One form is very low, only 1 to 1.5 dm. high, very glandular and with thick, cordate leaves. It is of such a character as one would expect *P. heterophylla* to assume in such a locality as the sand hills. Thedford, June 14 (No. 1287). Another form, more grayish and less glandular, was collected near Cody's Lakes, August 11, and near Mullen, July 23 (No. 1808); a third, much taller, resembling more the true *P. virginiana,* but villose rather than viscid, was found on a hillside near Plummer Ford, July 3.

Physalis heterophylla umbrosa, var. nov.

It resembles a tall form of *P. virginiana*, and its peculiarity is perhaps due to the shaded locality in which it grows. It has very thin, large leaves, nearly smooth; plant not at all viscid, but with a fine pubescence mixed with long, jointed hairs. The same plant was collected by Smith & Pound, in 1892, in Cherry County, Nebr., and a similar one, but with smaller leaves, which are scarcely toothed, by myself at Scott's Bluffs, Nebraska, in 1881. I named the latter *Physalis mollis cinerascens*, which it resembles in the form of the leaves; in fact, it stands between the present form and the variety mentioned. Among bushes, Thedford, June 21 and August 22 (No. 1398).

Physalis lanceolata Mx. Fl. i, 149 (1803).

Dr. Gray,[1] I think, includes two distinct species under *P. lanceolata* Mx. Which of the two is the original *P. lanceolata* I am not ready to say, as I have not seen any type specimens. In his Manual[2] Dr. Gray acknowledges two forms which he calls *P. pennsylvanica* and *P. pennsylvanica* variety *lanceolata*. He describes the latter as "the narrow-leafed and pubescent form (5 to 15 inches high), especially the state with a hairy calyx (*P. lanceolata* Mx., *P. maritima* M. A. Curtis)." *P. maritima* he afterwards includes in *P. viscosa*. What Dr. Gray held to be the typical *P. lanceolata* Mx. seems therefore to be my plant. In the Synoptical Flora he describes under this name rather the form which in the Manual he calls *P. pennsylvanica*, hence I have hitherto regarded that as the true *P. lanceolata*. As synonyms under this Gray gives *P. pumila* Nutt.[3] and *P. elliotti* Kunze.[4] Nuttall's type specimen, preserved in the Philadelphia Academy of Science, I have seen. It is a more hairy form, but evidently belongs to *P. lanceolata* and is *P. lanceolata hirta* Gray, type specimens of which are in the National Herbarium. It is not different from Nuttall's plant. From the description in Linnæa of *P. elliotti* Kunze, it may seem likely to be the other species included by Gray under *P. lanceolata*, but the type specimens show that it is *P. viscosa spatulæfolia* (Torr.) Gray. As far as I know them the distinctions between the two are as follows:

The true *P. lanceolata* Mx. (*P. pennsylvanica lanceolata* Gray, Man. ed. 5; *P. lanceolata* Gray, Syn. Fl. in part) is low, 2 to 3 dm. high, upright or often decumbent; pubescence on the leaves short and stiff or none; on the stem, especially the younger parts, and on the calyx longer, hirsute; corolla scarcely 1.5 cm. in diameter; fruiting calyx globose-ovoid, scarcely angled and scarcely sunken at the base; berry yellow; leaves obovate, oblanceolate, or spatulate, mostly entire.

The other form or species, which is a variety of *P. virginiana* Mill. not Gray (*P. pennsylvanica* Gray, Man. ed. 5; *P. lanceolata* Gray, Syn. Fl. mainly), is generally taller, 3 to 5 dm. high, mostly upright, more or less pruinose, scarcely hispid at all; corolla 2 to 2.5 cm. in diameter, sulphur-yellow with dark eyes; fruiting calyx angled, with a deeply sunken, pyramidal base; fruit reddish; leaves ovate to lanceolate, angulately few-toothed or undulate, generally with an oblique base, and thinner than in the preceding.

My specimens in this collection belong to the true *P. lanceolata*. Thedford, June 16; South Whitman, July 5; Mullen, July 24 (No. 1330).

Datura tatula L. Sp. Pl. ed. 2, i, 256 (1762).

Introduced: near a hog pasture, Thedford, August 26 (No. 1727).

SCROPHULARIACEÆ.

Pentstemon haydeni Wats. Bot. Gaz. xvi, 311 (1891).

Collected in fruit only, on one of the highest sand hills, Plummer Ford, July 6 (No. 1506).

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[1] Proc. Amer. Acad. x, 67 (1874), and Syn. Fl. ii, pt. i, 236.

[2] Ed. 5, 382 (1867).

[3] Trans. Amer. Phil. Soc. n. ser. v, 193.

[4] Linnæa, xx, 33.

Pentstemon angustifolius Pursh, Fl. ii, 738 (1814), not Lindl. (1827); *Pentstemon cæruleus* Nutt. Gen. ii, 52 (1818).

Sand hills rare: Thedford, June 14 to 17; in fruit, Mullen, July 19 (No. 1284).

Pentstemon albidus Nutt. Gen. ii, 53 (1818).

Thedford, June 15 to 19; in fruit, Mullen, July 19 (No. 1316).

Mimulus glabratus jamesii (Torr. & Gr.) Gray, Syn. Fl. ii, pt. i, Suppl. 447 (1886); *M. jamesii* Torr. & Gr.; DC. Prodr. x, 371 (1846).

In and near the Middle Loup River: Thedford, June 16; Mullen, July 17 (No. 1331).

Veronica americana Schwein; Benth. in DC. Prodr. x, 468 (1846).

Same situations as the preceding: Thedford, June 16 (No. 1332).

Veronica peregrina L. Sp. Pl. i, 14 (1753).

In a prairie-dog town, near Thedford, June 15 (No. 1309).

Gerardia tenuifolia Vahl. Symb. Bot. iii, 79 (1794).

It may be *G. erecta* Walt.,[1] which is an older name, but the identity is doubtful. West Cody's Lake, August 10; Mullen, August 17; Thedford, September 11; Plummer Ford, August 22 (No. 1671).

Castilleja sessiliflora Pursh, Fl. ii, 738 (1814).

Rare: Thedford, June 17; Norway, June 23 (No. 1342)

OROBANCHACEÆ.

Thalesia fasciculata (Nutt.) Britton, Mem. Torr. Club, v, 298 (1894); *Orobanche fasciculata* Nutt. Gen. ii, 59 (1818).

Rare: Thedford, June 16 (No. 1323).

LENTIBULARIACEÆ.

Utricularia vulgaris L. Sp. Pl. i, 18 (1753).

Common in ponds near the rivers and in the lake region: Thedford, June 16 to 21; northeast of Whitman, July 31 (No. 1338).

VERBENACEÆ.

Verbena stricta Vent. Hort. Cels. t. 53 (1800).

Common: Norway, June 23; Dismal River, June 27; Forks of Dismal River, July 11; Mullen, July 18 (No. 1422).

Two miles northeast of Whitman Mr. Tulen found a patch a few rods in diameter, in which every plant had white flowers.

Verbena hastata × stricta.

This hybrid was reported and described by Dr. Englemann[2] under the name *V. paniculata × stricta.* On the banks of Middle Loup, north of Mullen, together with the preceding and the following, July 18 (No. 1564).

Verbena hastata L. Sp. Pl. i, 20 (1753).

Forks of Dismal River, July 11; Mullen, July 18; Thedford, September 8 (No. 1515).

Verbena urticifolia L. Sp. Pl. i, 20 (1753).

Rare: woods near Plummer Ford, August 22 (No. 1716).

Verbena bracteosa Mx. Fl. ii, 13 (1803).

Dry prairies: Thedford, June 21 (No. 1306).

Phryma leptostachya L. Sp. Pl. ii, 601 (1753).

In damp woods: Forks of Dismal River, July 12; Forks of Middle Loup, July 26 (No. 1529).

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[1] Fl. Car. 170 (1778).

[2] Amer. Journ. Sci. xlvi, 100 (1844).

LABIATÆ.

Teucrium occidentale Gray, Syn. Fl. ii, pt. i, 349 (1878).

Among bushes: Forks of Middle Loup River, July 27; 15 miles south of Whitman, August 3; 3 miles northeast of the same, July 31 (No. 1610).

Mentha canadensis L. Sp. Pl. ii, 577 (1753).

In wet places: northeast of Whitman, July 31; Cody's Lakes, August 11 (No. 1628).

Lycopus virginicus L. Sp. Pl. i, 21 (1753).

The leaves in my specimen are subsessile and the stem more acutish-angled, pubescent. Among bushes, near Thedford, August 17 (No. 1830). In open places the plant becomes lower and more strict. Grant County, August 3; Cody's Lakes, August 9 (No. 1641).

Lycopus lucidus Turcz.; Benth. in DC. Prodr. xii, 178 (1848).

Cody's Lakes, August 10; South Dismal River, August 14; Mullen, August 17 (No. 1658). A form of the same with inconspicuous bracts, which, as also the calyx lobes, are slender and subulate, and with the perennial part of the rootstock much thickened-swollen, was found at Thedford, August 19 (No. 1702).

Lycopus sinuatus Ell. Bot. S. Car. & Georg. i, 27 (1816).

Mullen, July 17; Cody's Lakes, August 9 (No. 1655).

Kœllia lanceolata (Willd.) Kuntze, Rev. Gen. ii, 520 (1891); *Brachystemum lanceolatum* Willd. Enum. 623 (1809).

Banks of Middle Loup River, Mullen, July 17; South Dismal River, August 14 (No. 1560).

Hedeoma hispida Pursh, Fl. ii, 414 (1814).

Not common: Thedford, June 16 and 20 (No. 1312).

Monarda fistulosa L. Sp. Pl. i, 22 (1753).

Forks of Dismal River, July 11; Mullen, July 17; Forks of Middle Loup River, July 26 (No. 1531).

Monarda citriodora Cerv.; Lag. Nov. Gen. & Sp. 2 (1816).

On dry prairies: Thedford, June 21; Dismal River, June 27 (No. 1387).

Prunella vulgaris L. Sp. Pl. ii, 600 (1753).

On moist hillsides: Thedford, June 21; Mullen, July 20 (No. 1347).

Scutellaria galericulata L. Sp. Pl. ii. 599 (1753).

On the river banks and in wet meadows: Plummer Ford, July 3; Forks of Dismal River, July 11; northeast of Whitman, July 31; Cody's Lakes, August 11 (No. 1490).

Scutellaria lateriflora L. Sp. Pl. ii, 598 (1753).

River banks: South Dismal River, August 14; Thedford, September 9 (No. 1691).

PLANTAGINACEÆ.

Plantago purshii Rœm. & Schult. Syst. iii, 120 (1818).

Prairies: Thedford, June 15 (No. 1310). In very dry places, e. g., in prairie-dog towns, the plant becomes very delicate and less woolly, with oval few-flowered heads. Thedford, June 14 (No. 1294).

NYCTAGINACEÆ.

Allionia hirsuta Pursh, Fl. ii, 728 (1814).

Under this I place several forms, of which, perhaps, one or two good varieties might be made; but as I have not seen them from other localities, it is not advisable to separate them at present. These forms are as follows:

1. The more typical form with lanceolate or oblong leaves and the stem little hairy except at the nodes. I have collected a similar form, but with still narrower,

nearly linear-lanceolate leaves, in western Nebraska and in the Black Hills of South Dakota. Dismal River, near Plummer Ford, July 6 to 8; Forks of Middle Loup, July 27; sand hills northeast of Whitman, July 29; Mullen, July 18 (No. 1509).

2. A stouter form, hirsute all over; leaves ovate or oblong-ovate. Plummer Ford, July 4; Mullen, July 19; Dismal River, July 27 (No. 1433).

3. A very stout form with purplish stem, hirsute all over, and with broad leaves, the lower broadly ovate, obtuse. Forks of Middle Loup, July 27 (No. 1810).

4. A few specimens with thick and fleshy leaves, hirsute, especially on the ribs; stem densely hirsute, panicle crowded. Mullen, July 18 (No. 1799).

Allionia nyctaginea Mx. Fl. i, 100 (1803).

Not common in the sand-hill region. Plummer Ford, July 5; Mullen, July 20 (No. 1496).

Abronia fragrans Nutt.; Hook. Kew Journ. Bot. v, 261 (1853).

Planted from seeds collected in the neighborhood; but I did not see any wild plant. Farther west it is very common. Thedford, June 19 (No. 1263).

AMARANTHACEÆ.

Amaranthus retroflexus L. Sp., Pl. ii, 991 (1753).

In an old field: Mullen, July 18 (No. 1798).

Amaranthus blitoides Wats. Proc. Amer. Acad. xii, 273 (1877).

The stem is often more or less succulent. Thedford, June 21; Mullen, July 18 (No. 1291). No. 1695 is a form with smaller leaves and the peduncles more or less thickened; road: Mullen, July 19.

Amaranthus albus L. Sp. Pl. ed. 2, ii, 1404 (1763).

In my specimens the seeds are evidently not rugose. Thedford, August 26; northeast of Whitman, July 29 (No. 1614).

Amaranthus torreyi[1] (Gray) Benth.; Wats. Bot. Cal. ii, 42 (1880); *Amblogyne torreyi* Gray, Proc. Amer. Acad. v, 167 (1861).

Common in the sand hills along Dismal River, especially around Plummer Ford. July 8 (No. 1370).

This has been confused with *Acnida tuberculata*. The leaves are thicker, more veiny, obovate to ovate, obtuse, but mucronate, resembling those of *Amaranthus blitoides*. On the sand hills, Natick, June 20; Plummer Ford, July 8 (No. 1370).

Acnida tuberculata Moq. in DC. Prodr. xiii, pt. ii, 277 (1849).

The form common in eastern Nebraska with large thin leaves, lanceolate to oval, generally tapering at both ends, was growing on lowlands: Forks of Middle Loup, July 29; northeast of Whitman, August 1; West Cody's Lake, August 10 (No. 1674). At Plummer Ford, July 8, was found a similar form, but with narrowly oblong to lanceolate, mucronate leaves, and the lower fertile flowers in small heads (No. 1513). In the dry alkaline lakes west and north of Whitman was found a low-branched form, with small leaves and reddish stems and flowers, July 31 and September 20 (No. 1778).

Frœlichia floridana (Nutt.) Moq. in DC. Prodr. xiii, pt. ii, 420 (1849); *Oplotheca floridana* Nutt. Gen. ii, 79 (1818).

Mr. J. M. Holzinger has united this with *F. gracilis*. As they present themselves in this state, however, they are distinct. In *F. floridana* the wings of the fruiting calyx are erose-dentate, not spiny except the lower teeth; in *F. gracilis* the teeth all become spines: Mullen, July 24 (No. 1594). In the sand hills near Plummer Ford, August 21, I found a giant form, 10 to 12 dm. high, with bracts nearly black in age, and large leaves, somewhat over 1 dm. in length (No. 1838).

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[1] Determined by Prof. J. M. Coulter.

CHENOPODIACEÆ.

Cycloloma atriplicifolium (Spreng.) Coulter, Mem. Torr. Club, v, 143 (1894); *Kochia atriplicifolia* Spreng. Nacht. Fl. Hall. ii, 35 (1801); *Salsola platyphylla* Mx. Fl. i, 174 (1803).

Mullen, July 17 and 24; Natick, September 11 (No. 1585).

Chenopodium leptophyllum (Moq.) Nutt.; Moq. in DC. Prodr. xiii, pt. ii, 71 (1849); *C. album leptophyllum* Moq. in DC. Prodr. loc. cit.

My specimens have a little broader leaves than usual. Common: Thedford, June 21; Mullen, July 18; Norway, June 22 (No. 1386).

No. 1835 is a form of this species that deserves a varietal name perhaps better than the next. It has the leaves large, sometimes 5 cm. long and 2.5 cm. wide, very thin, glabrate above and somewhat hastately lobed at the base. Mullen, July 17; Plummer Ford, August 22.

Chenopodium leptophyllum oblongifolium Wats. Proc. Amer. Acad. ix, 95 (1874).

Scarcely deserving a varietal name. Dry soil: Mullen, July 24 (No. 1836).

Chenopodium leptophyllum subglabrum Wats. Proc. Amer. Acad. ix, 95 (1874).

This may be a distinct species, at least is a good variety. In its slender peduncles, distant flowers, and smooth leaves it resembles somewhat *C. boscianum*, from which, however, it is easily distinguished by its narrow leaves. Norway, June 23; Thedford, June 27; Plummer Ford, July 3 to 6; Mullen, July 17 and 18 (No. 1351).

Chenopodium fremontii Wats. Bot. King Surv. 287 (1871).

This is the same as Nos. 570 and 1734 of Wright's collection, which constitute a part of the material on which Watson based this species. Watson's own specimens, No. 973 in the King Survey collection, however, are undeveloped, and have very small leaves, and to me they seem to belong to a different species.

Always growing in shade: Dismal River, June 29; Plummer Ford, August 22; Whitman, September 20. Some of the specimens from Plummer Ford are more mealy than usual (No. 1450).

Chenopodium fremontii incanum Wats. Proc. Amer. Acad. ix, 94 (1874).

Perhaps also a good species; apparently found only in prairie-dog towns. Thedford, June 19 and 21; September 7 (No. 1394).

Chenopodium album L. Sp. Pl. i, 219 (1753).

The common form was rare. Its place as a weed seems to be taken by *C. leptophyllum*. Forks of Dismal River, June 11 (No. 1524). A form with thin leaves was collected near the Forks of Dismal River, July 13; Mullen, July 17 (No. 1542).

Chenopodium hybridum L. Sp. Pl. i, 219 (1753).

Not uncommon along Dismal River: Plummer Ford, August 22; Forks of Dismal River, July 12 (No. 1525).

Chenopodium rubrum L. Sp. Pl. i, 218 (1753).

Swampy place near a lake, northwest of Whitman, September 20 (No. 1791). A low, autumnal form was collected in a dry lake, west of Whitman, September 19 (No. 1782).

Corispermum hyssopifolium L. Sp. Pl. i, 4 (1753).

Not uncommon: Mullen, July 17, September 16; Natick, September 11 (No. 1647).

Salsoli kali tragus (L.) Moq. in DC. Prodr. xiii, pt. ii, 187 (1869); *Salsola tragus* L. Sp. Pl. ed. 2, i, 322 (1762).

This weed is rapidly spreading through Nebraska. The railroads, especially through the cattle cars, seem to be the principal means by which it is distributed. It had established itself along the railroad at Thedford, August 28; less fully at Mullen, July 24 and September 16. I found a few specimens even near Plummer Ford, 15 miles from the railroad, August 22 (No. 1593).

Sarcobatus vermiculatus (Hook.) Torr. **Emory's Rep. 150 (1848); *Batis* (?)** *vermiculatus* Hook. Fl. Bor. Amer. ii, 128 (1838).

This was seen on the railroad embankment near Mullen July 24, but no specimens were secured.

POLYGONACEÆ.

Eriogonum annuum Nutt. Trans. Amer. Phil. Soc. n. ser. v, 184 (1833–37).

On the sand hills northeast of Whitman, July 31; Mullen, July 19 and 22; Cody's Lakes, August 10; Natick, September 11 (1580).

Rumex venosus Pursh, Fl. ii, 733 (1814).

On the railroad embankment near Thedford, June 14 and 17 (No. 1298).

Rumex britannica L. Sp. Pl. i, 334 (1753).

Cody's Lakes, August 10; Plummer Ford, August 22 (No. 1670). This has not hitherto been reported from Nebraska.

Rumex persicarioides L. Sp. Pl. i, 335 (1753).

Along Middle Loup and in the wet valleys of Grant County: Mullen, July 18; northeast of Whitman, July 31; Cody's Lakes, August 10; Thedford, August 29 (No. 1572).

Polygonum aviculare L. Sp. Pl. i, 362 (1753).

Common throughout the region: Forks of Dismal River, July 12; Cody's Lakes, August 9; Thedford, September 7 (No. 1535). A form growing in shade, with very thin leaves, may belong here. As no fruits were found, the identification is somewhat doubtful. Mullen, September 15 (No. 1772).

Polygonum litorale Link, Schrad. Journ. Bot. i, 54 (1799).

Common along the railroad embankment near Mullen, July 11 and September 15 (No. 1771).

Polygonum camporum Meisn. in Mart. Fl. Bras. v, pt. i, 21 (1855).

Along the railroad at Thedford, September 7; Mullen, September 13 (No. 1763).

Polygonum ramossisimum Mx. Fl. i, 237 (1803).

The typical form was collected at Mullen, July 18 and September 16; Cody's Lakes, August 10 (No. 1579). A very slender form with appressed branches was collected in Grant County, August 4 (No. 1820). Another form with small leaves somewhat resembling the preceding in appearance was found at Mullen, September 14 (No. 1769). A few specimens were nearly prostrate. Mr. Small says that they belong probably to what has been named *P. ramosissimum patulum* by Engelmann in manuscript. These specimens look very different from those referred to the same variety in my Black Hills collection, having very thin leaves, resembling somewhat those of *P. erectum*, but this may be explained by the fact that they were growing in shade. Mullen, September 14 (No. 1768).

Polygonum punctatum leptostachyum (Meisn.) Small, Bull. Torr. Club, xix, 356 (1892); *Polygonum acre leptostachyum* Meisn. in DC. Prodr. xiv, 108 (1856).

The style is often 2–parted and the achenes are lenticular and smooth and shining. In some places the plants were simple, slender, and scarcely rooting: Mullen, August 17; Thedford, September 9; Forks of Middle Loup, July 26 (No. 1602). In other places, the plants were very much branched and the leaves larger: West Cody's Lake, August 10 (No. 1672).

Polygonum lapathifolium L. Sp. Pl. i, 360 (1753).

The more common form with stout stem and large leaves was collected on river banks: Mullen, July 17; Forks of Middle Loup, July 28; northeast of Whitman, July 31 (No. 1571). No. 1629 is a form with smaller leaves, the whole plant more yellowish: Grant County, July 31. Another form, with low stem, short and dense spikes, and larger flowers was collected in dry lakes in Grant County, September 20 (No. 1794).

Polygonum persicarioides H. B. K. Nov. Gen. and Sp. ii, 179 (1817).
This was collected by Herbert J. Webber at Thedford in 1889, but was not found by the present collector.

Polygonum hartwrightii Gray, Proc. Amer. Acad. viii, 294 (1870).
Two forms were found, one upright and more hairy, the other procumbent and rooting in the mud. The first was collected at Swan Lake, August 7, and northeast of Whitman, July 29 (No. 1649); the other was found near a lake, northwest of Whitman, September 20 (No. 1793).

Polygonum emersum (Mx.) Britton, Trans. N. Y. Acad. viii, 73 (1889); *Polygonum amphibium emersum* Mx. Fl. i, 240 (1803).
More or less hairy, leaves even subcanescent beneath, upper part of the stem and ocreæ strigose, peduncles strigose or glandular, bracts *conspicuously strigose* and *ciliate*. Dry lakes in Grant County, July 29 to 31 (No. 1613). One specimen was found in Swan Lake, August 7, that had plainly ciliate ocreæ and shorter spike, perhaps a hybrid with the preceding (No. 1822).

Polygonum amphibium L. Sp. Pl. i, 361 (1753).
I secured one specimen in Swan Lake, August 7 (No. 1653); Mr. N. P. Tulen collected several.

Polygonum pennsylvanicum L. Sp. Pl. i, 362 (1753).
I refer this questionable plant to *P. pennsylvanicum*, which it resembles, although the flowers are smaller, the stamens 5 instead of 8, and the glands sparser and less stipitate. Mr. Small did not name it as he did not feel satisfied as to where it should be placed. Dry pond among the sand hills: Mullen July 24 (No. 1591).

Polygonum sagittatum L. Sp. Pl. i, 363 (1753).
Common in wet meadows in Thomas County: Thedford, August 19; Plummer Ford, August 22 (No. 1708).

Polygonum scandens L. Sp. Pl. i, 364 (1753).
Common along South Dismal River, August 11 (No. 1679).

Polygonum convolvulus L. Sp. Pl. i, 364 (1753).
Mullen, July 11 (No. 1521).

Fagopyrum fagopyrum (L.) Karst. Deutsch. Fl. 522 (1880–1883); *Polygonum fagopyrum* L. Sp. Pl. i, 364 (1753).
Escaped: Mullen, July 18; Thedford, August 26 (No. 1567).

SANTALACEÆ.

Comandra pallida A. DC. Prodr. xiv, 636 (1857).
On the sand hills: Thedford, June 19 (No. 1363).

EUPHORBIACEÆ.

Euphorbia petaloidea Engelm. Bot. Mex. Bound. 185 (1859).
In the common form the leaves are about 2 to 3 cm. long and 6 mm. wide and the gland-appendages large. Thedford, June 20 and September 7; Dismal River, June 27; Plummer Ford, July 3; Mullen, July 27 (No. 1372). An autumnal form has narrower and shorter leaves and smaller gland-appendages. Thedford, September 9 (No. 1744).

Euphorbia geyeri Engelm.; Engelm. & Gr. Bost. Journ. Nat. Hist. v, 260 (1845).
In most of the specimens the seeds are large, in this respect and in form and color resembling those of *E. petaloidea*. In the sand hills: Plummer Ford, July 6; Cody's Lakes, August 9; Natick, September 11 (No. 1504). In a few specimens the seeds are much smaller, and also the leaves: Thedford, September 9 (No. 1753).

Euphorbia serpyllifolia Pers. Syn. Pl. ii, 14 (1807).

Only a small specimen collected on the railroad embankment near Mullen, July 24. This seems to be nearest the variety *consanguinea*, but the material is too meager to decide (No. 1833).

Euphorbia glyptosperma Engelm. Bot. Mex. Bound. ii, 187 (1859).

Very variable. Some forms are prostrate and spreading, with broad leaves resembling those of *E. geyeri*, except that they are slightly toothed near the apex: Thedford, June 18; Forks of Dismal River, July 12; Mullen, July 18; Forks of Middle Loup, July 27 (No. 1373). Another form has narrower, that is, oblong, leaves and ascending stem: Forks of Dismal River, July 11; northeast of Whitman, August 4; Mullen, July 19 and September 16 (No. 1527). A third form, collected at Thedford, September 9, is upright and slender, and has very narrow leaves (No. 1742).

Euphorbia hexagona Nutt.; Spreng. Syst. iii, 791 (1826).

Sand hills: Mullen, July 17 and September 16 (No. 1545).

Croton texensis (Klotzsch) Muell. Arg. in DC. Prodr. xv, 692 (1866); *Hendecandra texensis* Klotzsch, in Erichs. Archiv. i, 252 (1841).

Common in the sand hills: Thedford, June 17; Dismal River, July 29; Plummer Ford, July 3; Forks of Dismal River, July 12; Mullen, July 22 (No. 1430).

ULMACEÆ.

Ulmus americana L. Sp. Pl. i, 226 (1753).

This was collected only in leaf, on the banks of South Dismal River, July 13. Some of the trees were of the common form with smooth twigs (No. 1540). Others had the young twigs pubescent, as in *U. fulva*, otherwise agreeing fully with *U. americana* (No. 1541). The first form was known as white elm, the latter as water elm.

Celtis occidentalis L. Sp. Pl. ii, 1044 (1753).

Here and there on the hillsides near the rivers and on the banks: Norway, June 23; Dismal River, July 11 (No. 1410). At the last place I found trees about 0.5 m. in diameter.

URTICACEÆ.

Humulus lupulus L. Sp. Pl. ii, 1028 (1753).

Forks of Dismal River, July 13; but neither flowers nor fruit were seen (No. 1539).

Urtica dioica L. Sp. Pl. ii, 984 (1753).

A slender plant with thin, broadly cordate leaves, which I take to be a form of this species, although the leaves are not at all downy beneath. Flowers are wanting (No. 1790).

Urtica gracilis Ait. Hort. Kew. iii, 341 (1789).

Very variable. One form collected has narrow, sharply serrate, short-petioled leaves, which are bristly along the veins and on the petioles; flower cluster short. Collected 20 miles south of Whitman, August 4; Plummer Ford, August 23 (No. 1821). Another form is similar except that it has broader leaves and longer petioles and peduncles: Mullen, July 17 (No. 1558). The third, with narrow leaves and slender peduncles, is the most common form: Plummer Ford, July 4 and August 22; Mullen, September 16 (No. 1520).

Adicea pumila (L.) Raf. Ann. Nat. 179 (1815); *Urtica pumila* L. Sp. Pl. ii, 984 (1753).

Mullen, July 27 and August 19; South Dismal River, August 12; Thedford, September 7; west of Whitman, September 19 (No. 1609).

Bœhmeria cylindrica (L.) Willd. Sp. Pl. iv, 340 (1805); *Urtica cylindrica* L. Sp. Pl. ii, 984 (1753).

Wet meadows, among bushes: Halsey and Natick, September 11 (No. 1745).

Parietaria pennsylvanica Muhl.; Willd. Sp. Pl. iv, 955 (1805).

In shady places: Dismal River, June 29; Forks of Dismal River, July 12; Mullen, July 26; Cody's Lakes, August 11 (No. 1473).

SALICACEÆ.

Salix fluviatilis Nutt. Sylva, 73 (1842); *S. longifolia* Muhl. Neue Schrift. Gesell. Naturf. Freunde Berlin, iv, 238 (1803), not Lam.

Common along the streams: Thedford, June 15; Norway, June 23; South Dismal River, August 14; Mullen, July 20 (No. 1315).

? Salix cordata Muhl. Neue Schrift. Gesell. Naturf. Freunde Berlin, iv, 236 (1803).

This is a common willow in Nebraska and has gone under this name, although it does not agree with the description in all respects. Plummer Ford, July 5 (No. 1498).

Salix cordata angustata (Pursh) Anders. Monogr. Sal. 159 (1867); *S. angustata* Pursh, Fl. ii, 613 (1814).

Collected in fruit only; but it seems to agree fully with the specimens collected and named by Mr. Bebb. Norway, June 22 (No. 1412); Thedford, July 16; South Dismal River, August 12 (No. 1329).

Salix cordata vestita Anders. Monogr. Sal. 159 (1867).

Neither fruit nor flowers seen. On the banks of Middle Loup, north of Mullen, July 19 (No. 1581).

Populus deltoides Marsh. Arb. Amer. 106 (1785).

According to Mr. Sudworth this is an older name for *Populus monilifera* Ait.[1] Here and there on the hills, near the streams: Norway, June 22; Mullen, July 19 (No. 1411).

CERATOPHYLLACEÆ.

Ceratophyllum demersum L. Sp. Pl. ii, 992 (1753).

Swan Lake, Grant County, August 7 (No. 1823).

ORCHIDACEÆ.

Habenaria hyperborea (L.) R. Br.; Ait. Hort. Kew, ed. 2, v, 193 (1813); *Ophrys hyperborea* L. Mant. i, 121 (1767).

In wet meadows: Thedford, June 15 and 19, September 7; Forks of Dismal River, July 12 (No. 1297).

Near Thedford: specimens not secured.

Leptorchis lœselii (L.) MacMillan, Metasp. Minn. Val. 173 (1893); *Ophrys lœselii* L. Sp. Pl. ii, 946 (1753); *Liparis lœselii* L. C. Richard; Lindl. Bot. Reg. t. 882 (1825).

Gyrostachys cernua (L.) Kuntze, Rev. Gen. Pl. pt. ii, 664 (1891); *Ophrys cernua* L. Sp. Pl. ii, 946 (1753).

Not very common, in wet meadows: Plummer Ford, August 23; Thedford, August 26 (No. 1719).

IRIDACEÆ.

Sisyrinchium bermudiana L. Sp. Pl. ii, 954 (1753).

Prairies near Thedford, June 16 (No. 1251).

LILIACEÆ.

Allium mutabile Mx. Fl. i, 195 (1803).

Prairies, Thedford, June 15 (No. 1290).

Polygonatum biflorum (Walt.) Ell. Bot. S. Car. & Georg. i, 393 (1817–18); *Convallaria biflora* Walt. Fl. Car. 122 (1788).

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[1] Hort. Kew. iii, 406 (1789).

A form approaching the next, from which it differs little, except in its smaller, scarcely amplexicaul leaves and its 1- or 2-flowered peduncles. Hillside about 100 meters above the bed of Dismal River, near Plummer Ford, July 5 (No. 1483).

Polygonatum biflorum commutatum (Rœm. & Schult.) Morong, Bull. Torr.Club, xx, 480 (1893); *Convallaria commutata* Rœm. & Schult. Syst. Veg. vii, 1671 (1830).

Hillside, Norway, June 22 (No. 1408).

Vagnera stellata (L.) Morong, Mem. Torr. Club, v, 114 (1894); *Convallaria stellata* L. Sp. Pl. i, 316 (1753).

Among bushes on the banks of Middle Loup, Thedford, June 17 (No. 1340).

Yucca glauca Nutt. Fraser's Cat. (1813).

On the sand hills: Thedford, June 19; Plummer Ford, July 5 (No. 1359).

Smilax herbacea L. Sp. Pl. ii, 1030 (1753).

Hillsides: Plummer Ford, July 3; Forks of Middle Loup River, July 26; Seneca, September 16 (No. 1455).

COMMELINACEÆ.

Commelina virginica L. Sp. Pl. ed. 2, i, 61 (1762).

Not uncommon in the sand hills: Thedford, June 17; Dismal River, June 29 (No. 1345).

Tradescantia virginiana L. Sp. Pl. i, 288 (1753).

In eastern Nebraska this plant grows only on lowlands with alluvial soil, but here it is found from the tops of the sand hills down into the valleys, most commonly on the tops. Thedford, June 18, etc. (No. 1380).

JUNCACEÆ.

Juncus balticus montanus Engelm. Trans. St. Louis Acad. ii, 442 (1866).

Not uncommon. The typical form of this variety was found near Thedford, June 21 (No. 1401). A more slender form, with wiry stems and more elongated clusters, was collected near Natick, June 20 (No. 1376).

Juncus tenuis Willd. Sp. Pl. ii, 214 (1799).

This plant is very variable. Even this collection displays a great variety of forms. Perhaps the most typical one was collected at Plummer Ford, July 4; Forks of Dismal River, July 11; northeast of Whitman, August 1 (No. 1487). A taller form with broad sheaths and narrow, involute or channeled leaves, sepals longer than the pods and panicle dense and many-flowered, at Mullen, July 26; Natick, June 20 (No. 1374). A slender form, greener, and with open panicle, at Natick, June 20; Plummer Ford, July 3 (No. 1845). A similar form, but with very slender semi-flowered or 1-flowered pedicels and thread-like leaves, Plummer Ford, July 3 (No. 1464). No. 1318 is an unusually low form: Thedford, June 16; northeast of Whitman, August 1. No. 1841 is similar, but greener and more tufted: Mullen, July 18, September 9.

Juncus nodosus L. Sp. Pl. ed. 2, i, 466 (1762).

Common: Norway, June 22; Natick, June 20; Forks of Dismal River, July 12; Thedford, August 26 (No. 1369). All these specimens are low. On the Dismal River, June 27, were found taller (4–6 dm. high), more slender ones (No. 1441).

Juncus torreyi Coville, Bull. Torr. Club. xxii, 303 (1895); *Juncus nodosus megacephalus* Torr. Fl. N. Y. ii, 326 (1843), not *J. megacephalus* Curtis, 1835.

The most common form in Nebraska, having a few crowded heads, was collected south of Whitman, August 4 (No. 1817). A form with many heads in a compound panicle, was found at Mullen, July 18 (No. 1575).

Juncus marginatus Rostk. Monogr. Junc. 38 (1801).

This is comparatively rare in Nebraska. It was collected near Cody's Lakes, August 9 (No. 1827).

TYPHACEÆ.

Typha latifolia L. Sp. Pl. ii, 971 (1753).
River bank, Norway, June 22 (No. 1425).

Sparganium eurycarpum Engelm. in Gray Man. ed. 2, 430 (1856).
River banks: Thedford, June 16; Mullen, July 17 (No. 1339).

LEMNACEÆ.

Lemna minor L. Sp. Pl. ii, 970 (1753).
Common in pools along the rivers and in the lakes of Grant County: Thedford, June 14, etc. (No. 1257).

Lemna perpusilla Torr. Fl. N. Y. ii, 245 (1843).
I took this for *L. raldiviniana* Philippi, as the fronds are more or less elongated and as only one nerve could be seen. But comparison with the specimens in the National Herbarium persuaded me that it was *L. perpusilla*. The former has much narrower and thicker fronds. This is new to the State of Nebraska. In a spring near Plummer Ford, August 29 (No. 1723).

Lemna trisulca L. Sp. Pl. ii, 970 (1753).
Common in pools and lakes throughout: Thedford, June 21; west of Whitman, September 19 (No. 1397).

Lemna gibba L. Sp. Pl. ii, 970 (1753).
The specimens collected are much smaller than the specimens in the National Herbarium, which, however, are all European. The lower surface of the fronds is also of a darker color. In pools near Dismal River, Plummer Ford, July 5 (No. 1503). Also new to Nebraska.

Spirodela polyrrhiza (L.) Schleid. Linnæa, xiii, 392 (1839); *Lemna polyrrhiza* L. Sp. Pl. ii, 970 (1753).
Rare, in pools with *Lemna minor*, June 14 (No. 1258).

ALISMACEÆ.

Alisma plantago L. Sp. Pl. i, 342 (1753).
In dry lakes, northeast of Whitman, July 29 to 31 (No. 1616).

Sagittaria latifolia Willd. Sp. Pl. iv, 409 (1806).
The typical form was growing in the edges of streams and lakes: Mullen, July 17 (No. 1563). The form with narrower lobes, which has been called variety *angustifolia*, was growing in deeper water, outside of the typical form. Mullen, July 17 (No. 1562). Another form (marked on the label: Form C, by Jared G. Smith), with leaves about half as large as in the typical, was growing on sandy banks of the rivers. Forks of Dismal, July 12 (No. 1533). No. 1812 is a diminutive form of the same. Forks of Middle Loup, July 27.

Sagittaria arifolia Nutt.; J. G. Smith, Ann. Rep. Mo. Bot. Gard. vi [reprint 6], pl. i (1894).
The character that first arrested my attention was the bracts, which are lanceolate and much longer than in *S. latifolia*. In streams: Forks of Middle Loup River, July 26; South Dismal River, August 14 (No. 1809). No. 1811 is a form having thinner, nearly membranaceous leaves with shorter lobes. Forks of Middle Loup River, July 27.

NAIADACEÆ.

Triglochin maritima L. Sp. Pl. i, 339 (1753).
In a meadow, near Thedford, June 14 (No. 1280).

Potamogeton natans L. Sp. Pl. i, 126 (1753).
In lakes in Grant County: Swan Lake, August 7; northwest of Whitman, September 19 (No. 1652).

Potamogeton oakesianus Robbins, in Gray, Man. ed. 5, 485 (1867).

This was collected by Herbert J. Webber in 1889, near Thedford, but was not obtained by the present collector.

Potamogeton lonchites Tuckerm. Amer. Journ. Sci. n. ser. vi, 226 (1848).

Near to the typical form, but with smaller leaves. Norway, June 23 (No. 1421). Another form is also referred here, differing somewhat in the shape of the leaves. The floating ones are narrow and thin, and only 9- to 13-nerved. Dismal River, June 26 (No. 1846).

Potamogeton amplifolius Tuckerm. Amer. Journ. Sci. n. ser. vi, 225 (1848).

Common: Dismal River, June 26; Swan Lake, August 7; northwest of Whitman, September 19 (No. 1440).

Potamogeton perfoliatus L. Sp. Pl. i, 126 (1753).

This plant approaches the variety *richardsonii* A. Bennett, Journ. Bot. xxvii, 25 (1889).

In a lake northwest of Whitman, September 20 (No. 1792).

Potamogeton pusillus L. Sp. Pl. i, 127 (1753).

In a pool, near Middle Loup River, Thedford, June 21 (No. 1396).

Potamogeton pectinatus L. Sp. Pl. i, 127 (1753).

East Cody's Lake, August 9; lake northwest of Whitman, September 19 (No. 669). The specimens from the latter locality are of the form that has been called variety *scoparium* Wallr.

Potamogeton interruptus Kitaibel, in Schultes, Œst. Fl. ed. 2, 328 (1814).

This identification is somewhat doubtful. I have no mature fruit, but the long, broad leaves with strong transverse veins point to this species rather than to *P. pectinatus*, to one of which it must belong (No. 1439).

Zannichellia palustris L. Sp. Pl. ii, 969 (1753).

A small form, less than a decimeter high, rooting in the sand: East Cody's Lake, August 9, 10 (No. 1661).

Naias flexilis (Willd.) Rostk. & Schmidt, Fl. Sed. 384 (1824); *Caulinia flexilis* Willd. Abh. Akad. Berl. 95 (1803).

Only a few specimens collected, East Cody's Lake, August 9 (No. 1660). A more slender form, in appearance resembling more the next, but with broader, ovate fruit, not pitted, was found at the other end of the same lake, August 11 (No. 1828).

Naias guadalupensis (Spreng.) Morong, Mem. Torr. Club, iii, 60 (1893); *Caulinia guadalupensis* Spreng. Syst. i, 20 (1825).

In a lake, northwest of Whitman, September 19 (No. 1786). A rare plant in this latitude. It was first collected in Nebraska by Prof. Thomas A. Williams.

CYPERACEÆ.

Cyperus schweinitzii Torr. Ann. Lyc. N. Y. iii, 276 (1836).

A very common plant in the sand hills: Thedford, June 20; Norway, June 23; Plummer Ford, July 8; Mullen, July 19; northeast of Whitman, July 31 (No. 1371).

Cyperus houghtonii Torr. Ann. Lyc. N. Y. iii, 277 (1836).

A rare plant that for some time has been lost to science. It has been held not distinct from the preceding, but it can easily be distinguished by the less sharp angles of the culm, which are not scabrous, and by its not cuspidate glumes. My specimens agree fully with Torrey's description, except that the leaves are a little rough on the margin. Old field, near Natick, September 11 (No. 1747).

Cyperus strigosus L. Sp. Pl. i, 47 (1753).

A common plant on moist, sandy soil: Cody's Lakes, August 9; Thedford, August 26 (No. 1654).

Cyperus diandrus Torr. Cat. Pl. N. Y. 90 (1819).

An unusually low and cespitose form, growing on the sandy banks of the rivers: Plummer Ford, August 22; Thedford, August 26 (No. 1718).

Cyperus aristatus Rottb. Desc. & Icon. 23 (1773).

Near a dried-up pond in the sand hills, Mullen, July 28 (No. 1599).

Eleocharis palustris (L.) Rœm. & Schult. Syst. Veg. ii, 151 (1817); *Scirpus palustris* L. Sp. Pl. i, 47 (1753).

Approximately typical forms were collected at Dismal River, June 29; Plummer Ford, July 4; Cody's Lakes, August 7 (No. 1485). A lower more slender form with more obovate achenes with a short tubercle: Thedford, June 14 to 20 (No. 1265).

Eleocharis palustris glaucescens (Willd.) Gray, Man. ed. 5, 558 (1867); *Scirpus glaucescens* Willd. Enum. 76 (1809).

Natick, June 19; Dismal River, June 27; Plummer Ford, July 3; Forks of Dismal River, July 11 (No. 1436).

Eleocharis acicularis (L.) Rœm. & Schult. Syst. Veg. ii, 154 (1817); *Scirpus acicularis* L. Sp. Pl. i, 47 (1753).

In the specimens from Nebraska the spikes are lighter in color than usual: Thedford, June 17 and 20; Dismal River, June 27; Plummer Ford, July 3; north of Whitman, September 20 (No. 1337).

Fimbristylis castanea (Mx.) Vahl. Enum. ii, 292 (1806); *Scirpus castaneus* Mx. Fl. i, 31 (1803).

Perhaps this plant should have the name *F. umbellata* from *Schœnus umbellatus* Walt.,[1] but the identity is doubtful. Nebraska specimens are slender with heads of thin, bright-brown scales. In a meadow, near Thedford, August 19 (No. 1712).

Scirpus americanus Pers. Syn. Pl. i, 68 (1805).

Common in Nebraska: Thedford, June 15; Plummer Ford, July 4 (No. 1319).

Scirpus lacustris L. Sp. Pl. i, 48 (1753).

In Middle Loup River, Thedford, June 14 and 16 (No. 1276).

Scirpus lacustris occidentalis Wats. Bot. Cal. ii, 218 (1880).

This appears to be the first time this western plant has been collected east of the Rocky Mountains. In Middle Loup River, Thedford, June 21; Mullen, July 19 (No. 1388).

Scirpus atrovirens pallidus Britton, Trans. N. Y. Acad. ix, 14 (1889).

Dismal River, June 27; Forks of Dismal River, July 11 (No. 1427).

Scirpus fluviatilis (Torr.) Gray, Man. 527 (1848); *Scirpus maritimus fluviatilis* Torr. Ann. Lyc. N. Y. iii, 324 (1836).

Rare: in a dry lake northeast of Whitman, July 29 (No. 1612).

Eriophorum gracile Koch; Roth, Cat. ii, 259 (1800).

Collected in a swamp, near Dismal River, June 28 (No. 1446).

Carex pseudo-cyperus L. Sp. Pl. ii, 978 (1753).

This is perhaps the variety *americana* Hochst.[2] Not previously collected in Nebraska. Swamp, 20 miles south of Whitman, August 4 (No. 1646).

Carex hystricina Muhl.; Willd. Sp. Pl. iv, 282 (1805).

Common: Thedford, June 14; Dismal River, June 27 (No. 1277).

Carex trichocarpa aristata (R. Br.) Bailey, Bot. Gaz. x, 294 (1885); *Carex aristata* R. Br.; Richards. Bot. App. 751 (1823).

A tall plant growing in swampy places: Forks of Middle Loup River, July 27; 20 miles south of Whitman, August 4 (No. 1622).

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[1] Fl. Car. 70 (1788).

[2] Herb. Unio Itin. (1837).

Carex filiformis lanuginosa (Mx.) B. S. P. Prel. Cat. N. Y. 63 (1888); *Carex lanuginosa* Mx. Fl. ii, 175 (1803).

Together with preceding, south of Whitman, August 4 (No. 1816). A lower, more strict, and more leafy form was collected at Thedford, June 14 (No. 1266). Nearly all the specimens of the latter lacked the staminate spikes.

Carex rigida goodenovii (Gay) Bailey, Britten's Journ. Bot. xxviii, 172 (1890); *C. goodenovii* Gay, Ann. Sci. Nat. ser. 2, xi, 191 (1839).

This reference is made with some doubt. The specimen agrees well with the description of this species, but the achenes are deciduous, which should place it with *C. decidua* Boott. It also somewhat resembles *C. interrupta*, but the locality is out of the range of both these species. Norway, June 22 (No. 1797).

Carex nebraskensis Dewey, Amer. Journ. Sci. xviii, 102 (1854).
Common around Thedford, June 14; Mullen, July 17 (No. 1264).

Carex laxiflora varians Bailey, Mem. Torr. Club, i, 32 (1889).
Only three specimens secured at Plummer Ford, July 3 (No. 1461). The staminate spikes are small and subsessile.

Carex aurea Nutt. Gen. ii, 205 (1818).
Common: Thedford, June 16 (No. 1296).

Carex pennsylvanica Lam. Encycl. iii, 338 (1789).
On the prairies, but comparatively rare in this region: Thedford, June 20 (No. 1382).

Carex stenophylla Wahl. Kongl. Acad. Handl. ser. 2, xxiv, 142 (1803).
On the prairies, near Thedford, June 14 (No. 1254).

Carex longirostris Torr.; Schwein. Ann. Lyc. N. Y. i, 71 (1824).
In the woods, near Plummer Ford, July 3 (No. 1478).

Carex teretiuscula Good. Trans. Linn. Soc. ii, 163 (1794).
In the meadows, near Thedford, June 21 (No. 1399).

Carex marcida Boott; Hook. Fl. Bor. Amer. ii, 212 (1839).
The typical form, with narrow, at maturity nearly black, perigynia, was collected at Mullen, July 24 (No. 1805). Another form with greenish-brown (not mature) perigynia with broader wings, I refer also here: Thedford, June 16 (No. 1317). Also a similar form, but more slender and with more open spikes: Thedford, June 14 (No. 1274).

Carex douglasii Boott; Hook. Fl. Bor. Amer. ii, 213 (1839).
Prairie, Thedford, June 14 (No. 1250).

Carex interior Bailey, Bull. Torr. Club, xx, 426 (1893).
It is new to the State of Nebraska, but is rather common in the sand-hill region. Thedford, June 14 and 16 (No. 1261).

Carex stipata Muhl.; Willd. Sp. Pl. iv, 233 (1805).
Not common: Thedford, June 16; Plummer Ford, July 3 (No. 1298).

Carex scoparia Schk. Riedgr. Nacht. 20 (1806).
Rare; only a few specimens secured: Thedford, June 14 (No. 1268).

Carex straminea Willd.; Schk. Riedgr. 49 (1801).
Thedford; specimens not secured.

GRAMINEÆ.

Paspalum setaceum ciliatifolium (Mx.) Vasey, Contr. Nat. Herb. iii, No. 1, 17 (1892); *P. ciliatifolium* Mx. Fl. i, 44 (1803).

The specimens in the collection are lighter-colored and with larger flowers than usual. The leaves are ciliate, with long, silky hairs from small warts. Mullen, July 17 to 24 (No. 1582).

Beckmannia erucæformis (L.) Host, Gram. Austr. iii, 5, t. 6 (1805); *Phalaris erucæformis* L. Sp. Pl. i, 55 (1753).

Found only in one wet meadow, northeast of Whitman, July 29 (No. 1624).

Spartina cynosuroides (L.) Willd. Enum. i, 80 (1809); *Dactylis cynosuroides* L. Sp. Pl. i, 71 (1753).

Common near water: Mullen, July 18; northeast of Whitman, July 29 (No. 1577).

Panicum capillare L. Sp. Pl. i, 58 (1753).

Very large specimens were collected in an old field near the Forks of Dismal River, June 13 (No. 1538). Another form was collected in a dry lake west of Whitman, September 19 (No. 1788). In this the leaves are narrower and, as well as the sheaths, less hairy. Stem more slender and branched from the root; spikelets, as also the fertile flowers, acute. It seems to agree with variety *agreste* Gattinger,[1] but the spikelets are much larger and more pointed. This form is named variety *occidentale* in the National Herbarium, but no description has been published as far as I know.

Panicum virgatum L. Sp. Pl. i, 59 (1753).

The leaves are more or less hairy on the upper side, especially just above the ligule. In richer soil, it grows to 6 to 10 dm. high, and has an open panicle. Mullen, July 17; Forks of Middle Loup River, July 26; Grant County, July 29 (No. 1561) On the sand hills it is lower, 3 to 5 dm. high, more glaucous, and with shorter and denser panicle. Mullen, July 24; South Dismal River, August 14 (No. 1597). One of the best hay grasses.

Panicum scoparium Lam. Encycl. iv, 744 (1797).

In the region this was lower than it usually is in Nebraska. Thedford, June 14 (No. 1279). In some localities the plants were very low, only 1 to 1.5 dm. high, with crowded leaves and small panicle, partly included in the sheath. Dismal River, June 29 (No. 1493). A similar form, which has also very narrow linear-lanceolate leaves, has been placed with *P. wilcoxianum* in the National Herbarium, but I think it should be referred to *P. scoparium*. Mullen, July 24 (No. 1604).

Panicum wilcoxianum Vasey, Bull. 8, U. S. Dept. Agric. Bot. Div. 32 (1889).

This can be described by the statement that it has the leaves of *P. depauperatum*, but panicle and flowers more like those of *P. scoparium*: Thedford, June 16 and 19 (No. 1308).

Panicum dichotomum L. Sp. Pl, i, 58 (1753).

Wet meadow, Natick, June 20 (No. 1368).

Panicum crus-galli L. Sp. Pl. i, 56 (1753).

Two forms of this were collected: one prostrate, probably introduced, in a road, north of Mullen, July 24 (No. 1590); the other a tall, erect, glaucous form, undoubtedly native, in a swamp, 15 miles south of Whitman, August 4, and west of the same place, September 9 (No. 1643).

Chamæraphis viridis (L.) Porter, Bull. Torr. Club, xx, 196 (1893); *Panicum viride* L. Sp. Pl. ed. 2, i, 83 (1762).

Old field, Mullen, July 18 (No. 1568).

Cenchrus tribuloides L. Sp. Pl. ii, 1050 (1753).

Strangely, the sand bur was not common in the sand hills. Mullen, July 17 (No. 1548).

Homalocenchrus oryzoides (L.) Poll. Hist. Pl. Palat. i, 52 (1776); *Phalaris oryzoides* L. Sp. Pl. i, 55 (1753).

Wet meadows in Grant County, August 4, September 20 (No. 1644).

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[1] Tenn. Fl. 94 (1887).

Zizania aquatica L. Sp. Pl. ii, 991 (1753).

Swamps, northeast of Whitman, July 31; south of the same, August 3 (No. 1630).

Andropogon provincialis Lam. Encycl. i, 376 (1783).

The typical form, with slender, more or less purplish stem and spikes, bluish-green leaves, which are generally hairy on the upper surface, just above the ligules, slender spikes and twisted and bent awns, which are much longer than the glumes, grows nearly without exception on low, moist soil. This species, *Panicum virgatum*, and *Andropogon nutans avenaceus*, are the principal hay grasses of Grant County. Wet valley northeast of Whitman, July 29 to 31 (No. 1618).

Andropogon provincialis pycnanthus Hack. in DC. Monogr. Phan. vi, 443 (1889).

This approaches *A. hallii* in its large spikelets and more or less glaucous leaves and stem. Northeast of Whitman, in the drier part of the valley, July 31 (No. 1813).

Andropogon hallii Hack. Sitz. Akad. Wiss. Wien, 89, 127 (1884).

Some of the forms here referred to this species approach *A. provincialis* in many respects. Either the two are but one species or else they hybridize frequently, as nearly every grade between the two is found. In No. 1596 the size, hairiness, etc., of the rachis and spikelets are those of *A. hallii*, but the awn, that of *A. provincialis*. On hillsides: Mullen, July 24; Whitman, July 31.

On a sand hill near Dismal River, June 27, a very low and slender form, with short spikes, was collected. This bloomed a month earlier and nearly all the spikelets were infested with smut (No. 1449).

No. 1607 is a form that perhaps deserves a varietal name as well as those below. In this the rachis and pedicels are nearly destitute of hairs and the flowering glumes of the fertile flower awnless. Sand hills: Forks of Middle Loup, July 27; northeast of Whitman, July 31.

Andropogon hallii flaveolus Hack. Sitz. Akad. Wiss. Wien, 89, 128 (1884).

Sand hills: Cody's Lakes, August 7 to 9; Mullen, July 24 (No. 1802).

Andropogon hallii muticus Hack. DC. Monogr. Phan. vi, 444 (1889).

This is the most common form on the sand hills: Whitman, July 29 (No. 1595). It grades, however, into the other forms of *A. hallii*, and these into the forms of *A. provincialis*. *A. hallii* is a sand-hill plant, always more or less glaucous. *A. provincialis* grows in the wet valleys. On the hillsides and the dry parts of the valleys the intermediate forms are found.

Andropogon scoparius Mx. Fl. i, 57 (1803).

Specimens from the sand hills are always tufted, with flat sheath, glaucous, and with the joints of the spikes more hairy than usual. This is common on the sand hills, but regarded as a worthless grass. Cody's Lakes, August 9; South Dismal River, August 14 (No. 1665).

Andropogon nutans avenaceus (Mx.) Hack. in DC. Monogr. Phan. vi, 530 (1889); *Andropogon avenaceum* Mx. Fl. i, 58 (1803).

This is common on the lowlands and is one of the best hay grasses. Grant County, August 1, 4, and 10; South Dismal River, August 14 (No. 1638).

Phalaris arundinacea L. Sp. Pl. i, 55 (1753).

The specimens collected have usually narrow panicles, and are perhaps of a distinct form. Northeast of Whitman, in a wet valley, July 29 (No. 1621).

Aristida fasciculata Torr. Ann. Lyc. N. Y. i, 154 (1824).

A low and slender form with very long awns. On a dry hill near Thedford, June 15 and September 8 (No. 1300).

Aristida basiramea Engelm.; Vasey, Bot. Gaz. ix, 76 (1884).

The specimens in the collection were furnished me by Mr. C. C. Wright. The plants were low, with lateral awns 8 mm. long. Thedford, date not known (No. 1847).

Stipa spartea Trin. Mem. Acad. St. Petersb. ser. 6, i, 82 (1829).
Sand hills: Thedford, June 19 (No. 1402).

Stipa comata Trin. & Rupr. Mem. Acad. St. Petersb. ser. 6, v, 75 (1842).
Sand hills: Thedford, June 17; Norway, June 23; Dismal River, June 27; Mullen, July 17 (No. 1344). This and the preceding are said to make good hay if cut early.

Stipa viridula Trin. Mem. Acad. St. Petersb. ser. 6, ii, 39 (1836).
Rare; only one specimen in poor condition secured: Mullen, July 24 (No. 1598).

Oryzopsis micrantha (Trin. & Rupr.) Thurb. Proc. Acad. Phila. 1863, 78 (1863); *Urachne micrantha* Trin. & Rupr. Mem. Acad. St. Petersb. ser. 6, v, 16 (1842).
In shady places, mostly in woods: Plummer Ford, July 3; Mullen, July 19 (No. 1482).

Oryzopsis membranacea (Pursh) Vasey, Grasses S. W. pt. 2, t. 10 (1891); *Stipa membranacea* Pursh, Fl. ii, 728 (1814).
In a canyon, near Middle Loup, north of Mullen, July 17 (No. 1550).

Alopecurus geniculatus fulvus (J. E. Smith) Scribn. Mem. Torr. Club, v, 38 (1894); *Alopecurus fulvus* Smith, Engl. Bot. x, 1467 (1793).
Near the river at Plummer Ford, July 4 (No. 1488). It is regarded as a fair pasture grass, but is comparatively rare, and therefore of little importance.

Muhlenbergia pungens Thurb. Proc. Acad. Phila. 1863, 78 (1863).
This is one of the blowout grasses growing in the driest parts of the sand hills, generally in or near a blowout. Mullen, July 17 and 19, September 24; Cody's Lakes, August 9; Thedford, September 9 (No. 1551).

Muhlenbergia racemosa (Mx.) B. S. P. Cat. Pl. N. Y. 67 (1888); *Agrostis racemosa* Mx. Fl. i, 53 (1803).
Two forms were collected. One is strict and slender, with the flowering glumes cuspidate, and palets three-fourths the length of the glume. Meadows: Mullen, August 17; Thedford, August 19 (No. 1709). The other is branched near the base, and has the outer glumes with the awns one-half longer than the acute, but not pointed, flowering glume and palet, which are equal in length; hairs of the base of the flowers nearly one-half the length of the flowers. Thedford, September 13 (No. 1762). One of the best hay grasses.

Muhlenbergia mexicana (L.) Trin. Unifl. 189 (1824); *Agrostis mexicana* L. Mant. 31 (1767).
Of this species there were at least two distinct forms, one growing in the meadows and the other in the woods. The one which agrees best with the description in Mantissa, and may, therefore, be taken as typical, is nearly upright, resembling *M. racemosa* in habit, but more slender and with a narrower spike. In a meadow on South Dismal River (where it filled a space of a couple of acres and made a good hay crop), August 12 (No. 1686). More slender specimens were collected at Natick, September 11 (No. 1756), and a similar but shorter-leafed, purplish one at Thedford, September 13 (No. 1764).
The other form, which perhaps deserves a varietal name, is more of the habit of *M. sylvatica*, from which it differs mainly in the lack of the awn. The plant is slender, prostrate, with broader leaves and a more branched panicle. In mine the flowering glumes are scarious except the green nerves. Among high bushes, near the river, Thedford, August 19 (No. 1704).

Sporobolus cryptandrus (Torr.) Gray, Man. 576 (1848); *Agrostis cryptandra* Torr. Ann. Lyc. N. Y. i, 151 (1824).
The most common form in Nebraska with more or less included spikes and lead-colored flowers, was collected at Mullen, July 24, and August 17; Cody's Lakes, August 9 (No. 1697).
Another form with exserted purplish panicle, with reflexed branches, was collected on the banks of Middle Loup River, Thedford, August 19 (No. 1705).

Sporobolus cryptandrus robustus Vasey, Contr. Nat. Herb. i, 56 (1890).
On the sand hills: Mullen, July 17 and 24; Cody's Lakes, August 10 (No. 1549).

Sporobolus filiformis (Thurb.) nom. nov.; *Vilfa depauperata filiformis* Thurb.; Wats. Bot. King Surv. v, 376 (1872).

The latter is an older name than *Vilfa gracillima* Thurb. Bot. Cal. ii, 268 (1880), which was changed to *Sporobolus gracillimus* by Scribner. This western species, as far as I know, has not before been collected east of Utah and Montana. It was found abundantly around a spring, 2 miles west of Thedford, September 9 (No. 1741). These specimens are taller than those from the mountains. Stems often 2 dm. or more long, but slender, more or less decumbent. A few specimens were found one-half mile farther down the river, September 7 (No. 1759). These have larger flowers, nearly as large as *S. cuspidatus*, from which they are easily distinguished by the short outer glumes and annual roots. Professor Scribner thinks this is scarcely distinct from *S. depauperatus*.

Sporobolus asperifolius (Nees & Meyen) Thurb. Bot. Cal. ii, 269 (1880); *Vilfa asperifolia* Nees & Meyen; Trin. Mem. Acad. St. Petersb. ser. 6, iv, 95 (1840).
In wet meadows: Cody's Lakes, August 17; Mullen, August 17; Thedford, September 8 (No. 1657).

Agrostis alba L. Sp. Pl. i, 63 (1753).
A light-colored, slender form growing in shade: South Dismal River, July 13 (No. 1546).

Agrostis exarata Trin. Unifl. 207 (1824).
An approximately typical form was found near Plummer Ford, July 3 (No. 1842); a slender form with narrow spike-like panicle at Mullen, July 17 (No. 1800); a robust one with large panicle and broad (up to 6 or 7 mm. wide) leaves, Plummer Ford, July 4 (No. 1492).

Agrostis hiemalis (Walt.) B. S. P. Cat. Pl. N. Y. 68 (1888); *Cornucupia hyemalis* Walt. Fl. Car. 74 (1784).
Dismal River, June 27; Plummer Ford, July 4; Mullen, July 19 (No. 1438).
A variety of this species differing in the more robust and strict stem, the larger panicle, the broader, flat leaves (3 to 4 mm. wide), and the larger flowers with outer glumes that are nearly equal. It was mistaken for *A. altissima laxa* Tuckerm., but Professor Scribner has corrected the error and regards it as a luxuriant form or variety of *A. scabra*, which is held to be the same as Walter's *Cornucupiæ hyemalis*. Plummer Ford, July 4 (No. 1489).

Calamovilfa longifolia (Hook.) Hack. True Grasses, 113 (1890), *Calamagrostis longifolia* Hook. Fl. Bor. Amer. ii, 241 (1840).
Common on the sand hills, throughout: Mullen, July 22; northeast of Whitman, July 31 (No. 1804).

Calamagrostis canadensis (Mx.) Beauv. Agrost. 15 (1812); *Arundo canadensis* Mx. Fl. i, 73 (1803).
A slender form with loose panicle and broad, less acuminate, outer glumes: Whitman, July 29 (No. 1620).

Calamagrostis neglecta (Ehrh.) Gaertn. Fl. Wett. i, 94 (1799); *Arundo neglecta* Ehrh. Beitr. vi, 137 (1791).
Very variable. In some plants the panicle is nearly spike-like: Dismal River, June 27, Norway, June 22 (No. 1426). The specimens from Norway are more leafy, with narrower leaves. Some have a more open panicle, as those from Plummer Ford, July 4 (No. 1494). In a few specimens from Mullen, July 17, the panicle is large and dense and the leaves broad.

Schedonnardus paniculatus (Nutt.) Trelease; Branner & Coville, Rep. Geol. Surv. Ark. 1888, pt. 4, 236 (1891); *Lepturus paniculatus* Nutt. Gen. i, 81 (1818).
Rare: on sandy soil, Thedford, August 19 (No. 1710).

Bouteloua hirsuta Lag. Var. Cienc. y Litter. ii, pt. 4, 141 (1805).
Not common: Mullen, July 17, 18; Cody's Lakes, August 10 (No. 1552).

Bouteloua oligostachya (Nutt.) Torr.; Gray, Man. ed. 2, 553 (1856); *Atheropogon oligostachyum* Nutt. Gen. i, 78 (1818).
Rare: Plummer Ford, August 23; Mullen, July 19 (No. 1574). No. 1803 is a low form with a few glandular warts on the outer glumes, which are so characteristic of *B. hirsuta:* Mullen, July 24. This and the preceding constitute the winter pasturage of western Nebraska. In the fall, they become self-cured and make a good pasturage for the cattle.

Bouteloua curtipendula (Mx.) Torr. Emory's Rep. 153 (1848); *Chloris curtipendula* Mx. Fl. i, 59 (1803).
Not common: Plummer Ford, July 5; Forks of Dismal River, July 13 (No. 1499).

Bulbilis dactyloides (Nutt) Raf.; Kuntze, Rev. Gen. Pl. ii, 763 (1891); *Sesleria dactyloides* Nutt. Gen. i, 65 (1818).
Not common in the region; otherwise regarded as a good pasture plant, especially for winter pasture. This species is often monœcious, although more often dioecious. Prairie: Thedford, June 14, Norway, June 23 (No. 1253).

Sieglingia purpurea (Walt.) Kuntze, Rev. Gen. Pl. ii, 789 (1891); *Aira purpurea* Walt. Fl. Car. 78 (1788).
In sandy soil, mostly on the river banks: Mullen, August 17; Thedford, August 19; Plummer Ford, August 22; Natick, September 11 (No. 1698).

Leptochloa fascicularis (Lam.) Gray, Man. 588 (1848); *Festuca fascicularis* Lam. Tabl. Encycl. i, 189 (1791).
On sandy prairies, local: Thedford, August 21 (No. 1713).

Phragmites phragmites (L.) Karst. Deutsch. Fl. 379 (1880–83); *Arundo phragmites* L. Sp. Pl. i, 81 (1753).
In or near water: Plummer Ford, August 22; lakes in Grant County, July 31 (No. 1631).

Kœleria cristata (L.) Pers. Syn. Pl. i, 97 (1805); *Aira cristata* L. Sp. Pl. i, 63 (1753).
Wherever it grows abundantly it is an important factor in making up the pasturage in early spring: Thedford, June 14; Mullen, July 19 (No. 1273).

Kœleria nitida Nutt. Gen. i, 74 (1818).
Professor Scribner holds this to be a distinct species. It has generally been regarded as a variety of the preceding.
Thedford, September 9 (No. 1844).

Eatonia obtusata (Mx.) Gray, Man. ed. 2, 558 (1856); *Aira obtusata* Mx. Fl. i, 62 (1803).
Also an early pasturage grass on the dry prairies: Plummer Ford, July 4 (No. 1486).

Eatonia obtusata robusta Vasey, var. nov.[1]
Taller than the species, more robust, with broad leaves, 5 to 6 mm. wide. This grows in wet places, generally near rivers, and blooms later than the species: Mullen, July 17 (No. 1807).

Munroa squarrosa (Nutt.) Torr. Pac. R. Rep. iv, 158 (1856); *Crypsis squarrosa* Nutt. Gen. i, 49 (1818).
Rare in the region: Norway, June 23; Forks of Dismal River, July 12 (No. 1534).

Catabrosa aquatica (L.) Beauv. Agrost. 157 (1812); *Aira aquatica* L. Sp. Pl. i, 64 (1753).
In springs: Thedford, June 17; Plummer Ford, July 3 (No. 1381).

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[1] This name was given in the Report of the Commissioner of Agriculture for 1881, p. 322, with a reference to utility and habitat, but without description.

Eragrostis major, Host, Gram. Austr. iv, 14 (1809).

The common low, nearly prostrate form was found in roads and old fields: Mullen, July 20 and September 17; Thedford, September 7 (No. 1588). Another form, nearly upright and with many broad leaves, was found in fields: Forks of Dismal River, July 11; Natick, September 7 (No. 1522).

Eragrostis caroliniana (Spreng.) Scribn. Mem. Torr. Club, v, 49 (1894); *Poa caroliniana* Spreng. Mart. Fl. Hal. i, 33 (1807).

This has been confused with *E. pilosa*, from which it is very hard to distinguish it. Perhaps only a Western form of that species. Railroad embankment: Mullen, September 15 (No. 1774).

Eragrostis tenuis (Ell.) Gray, Man. ed. 2, 564 (1856); *Poa tenuis* Ell. Bot. S. Car. and Georg. i, 156 (1817).

This is one of the blowout grasses, growing on the drier sand hills. It is one of the most common plants in the region, and is very variable, its character probably depending upon the conditions under which it grows. A form with strict, elongated panicle, with many large spikelets, I take as typical. This has broad leaves, about 4 mm. wide, and conspicuous tufts of hairs at the mouth of the sheath: Cody's Lakes, August 10 (No. 1829). Another form with large, spreading panicle and long, involute leaves was collected at Thedford, September 13; Plummer Ford, August 22 (No. 1831). A third form was like the typical except that it was much smaller, its panicle small with comparatively few spikelets: Plummer Ford, August 23 (No. 1832). Near Mullen, July 18, a form was met having few-flowered (mostly 1- to 3-flowered) spikelets, with probably abortive flowers (No. 1569). This is, according to Professor Scribner, the variety *texensis* Vasey.

Eragrostis pectinacea (Mx.) Steudel, Syn. Pl. Gram. 272 (1855); *Poa pectinacea* Mx. Fl. i, 69 (1803).

A really ornamental grass with its large panicle of spikelets of a brilliant red color: Thedford, August 19; Plummer Ford, August 23 to 26 (No. 1711).

Poa arida Vasey, Contr. Nat. Herb. i, 270 (1893).

Three forms of this species, no one of which is typical. The first differs from the type, in being lower, and in having a smaller and narrower panicle (No. 1270). The second differs in its larger and more hairy spikelets, its stouter habit, its narrow, crowded panicle, and the flowering glumes, which are more hairy (No. 1286). The third is like the second, but has a more open panicle (No. 1271). The last two forms, together with specimens collected in Nebraska by Corbett (preserved in the Herbarium of the University of Nebraska) and specimens collected by Prof. Thos. A. Williams in South Dakota (one sheet preserved in the National Herbarium), very probably deserve to be regarded as a good variety. All the above forms were collected in meadows, near Thedford, June 14.

Poa pratensis L. Sp. Pl. i, 67 (1753).

Two distinct forms which probably belong to this were collected. One resembles the common form cultivated for lawns, but has smaller spikelets. Prairies, Thedford, June 14 (No. 1275). The other is a tall grass, which looks very different from the ordinary one. The panicle is denser, the branches less spreading, the spikelets large, the empty glumes scabrous on the margin, and the leaves longer and broader. Meadows, Thedford, June 14; Plummer Ford, July 4 (No. 1278).

Poa sp.

Differs from *P. fendleriana* (Steud.) Vasey[1] in not being a bunch grass, in the more hairy glumes, which have a narrower scarious portion, and in the long and broad leaves (1 to 2 dm. long and 5 mm. broad). The latter resemble much those of *Poa*

[1] Ill. N. A. Grasses, ii, 94 (1893); Steud. Syn. Gram. 278, 1855.

alpina, but are longer. From this species it also differs in its larger size, acute ligule, and the long, creeping rootstock. Rare: Thedford, June 14 (No. 1272).

Redfieldia flexuosa (Thurb.) Vasey, Bull. Torr. Club, xiv, 133 (1887); *Graphephorum* (?) *flexuosum* Thurb. Proc. Acad. Phila. 1863, 78 (1863).

A blowout grass, growing in the very driest and loosest sand. Near Middle Loup, north of Mullen, July 19; railroad embankment, east thereof, July 20 and August 17 (No. 1583).

Distichlis spicata stricta (Torr.) Scribner, Mem. Torr. Club, v, 51 (1894); *Uniola stricta* Torr. Ann. Lyc. N. Y. 155 (1824).

On sandy soil, near water: northeast of Whitman, July 29 (No. 1623); Cody's Lakes, August 9 (No. 1814).

Scolochloa festucacea (Willd.) Link, Hort. Berol. i, 137 (1827); *Arundo festucacea* Willd. Enum. i, 126 (1809).

This rare plant was collected in a lake, northwest of Whitman, September 20 (No. 1795). It is new to Nebraska.

Panicularia nervata (Willd.) Kuntze, Rev. Gen. Pl. ii, 783 (1891); *Poa nervata* Willd. Sp. Pl. i, 389 (1798).

The Nebraska forms of this species are much more slender than usual, and have a more or less drooping panicle of small spikelets: Thedford, June 14; Dismal River, June 27; Plummer Ford, July 3 (No. 1269). No. 1400 is a taller form with more spreading panicle, but not as robust as the species often grows in the East: Thedford, June 21; Plummer Ford, July 4.

Panicularia aquatica (L.) Kuntze, Rev. Gen. Pl. ii, 282 (1891); *Poa aquatica* L. Sp. Pl. i, 67 (1753).

In rivers: Plummer Ford, July 3; Mullen, July 18 (No. 1459).

Festuca octoflora Walt. Fl. Car. 81 (1788).

A worthless little grass. Dry soil, Thedford, June 14 (No. 1282).

Bromus ciliatus L. Sp. Pl. i, 76 (1753).

Meadows: Mullen, July 19; Plummer Ford, July 3; Forks of Dismal River, July 12 (No. 1404).

Bromus ciliatus porteri nom. nov.; *Bromus kalmii porteri* Coulter, Man. Rock. Mount. Reg. 425 (1885).

I can not find any authentic specimen of this variety in the National Herbarium. My specimens agree well with the description in Coulter's Manual and are exactly like specimens so labeled in the Herbarium of the University of Nebraska, the authenticity of which, however, is doubtful. Professor Scribner thinks that my specimens belong to a form of *B. ciliatus*, not of *B. kalmii*. Meadows: Mullen, August 19; Thedford, September 13 (No. 1775).

Agropyron repens glaucum (Desf.) Scribner, Mem. Torr. Club, v, 57 (1894); *Triticum glaucum* Desf. Tabl. Bot. Mus. 16 (1804).

Common throughout the region in the drier parts of the valleys: Plummer Ford, July 3; Dismal River, June 27. In an old haystack, northeast of Whitman, August 1, a form was found with broad, flat leaves, approaching the true *A. repens* (No. 1434). In rich soil, the spikelets often become large and double: Thedford, June 16, Plummer Ford, June 3 (No. 1796).

Agropyron violaceum (?) **majus** Vasey, Contr. Nat. Herb. i, 280 (1893).

Very similar to *A. tenerum*, but stouter; 10 to 12 dm. high; spike 15 to 25 cm. long, of numerous spikelets, which are larger and more crowded than in *A. tenerum;* glumes strongly veined, the empty ones often purplish; tinged and generally shorter than the spikelet; glumes mucronate or short-awned; joints of the spikelets pilose. This latter character may not be constant, but I have found it in all Nebraska specimens

examined, viz, from three localities in 1893, from Scott's Bluff in 1891, and also in Mr. Herbert Webber's specimens from Thedford in 1889. These latter were sent to Dr. Vasey for identification, by whom they were named *A. unilaterale* Vasey & Scribner. Dr. Vasey afterwards transferred them to *A. violaceum majus*. The type specimens of this variety seem to be tufted as in *A. tenerum* and not spreading by a creeping rootstock as in the Nebraska specimen. The hairiness of the joints of the spikelets is also lacking in the type specimens, but otherwise they are very similar. Valley, Grant County, July 20 and 31. Also seen at Mullen and Thedford (No. 1619).

Agropyron tenerum Vasey, Bot. Gaz. x, 258 (1885).
Rare: Dismal River, July 11 (No. 1516).

Agropyron caninum (L.) Rœm. & Schult. Syst. Veg. ii, 756 (1877); *Triticum caninum* L. Sp. Pl. i, 86 (1753).
In wet meadows, northeast of Whitman, July 29 (No. 1617).

Elymus macounii Vasey, Bull. Torr. Club, xiii, 119 (1886).
It may be this should be included in Agropyron. Perhaps Elymus and Agropyron should be made one genus, as there is no character that will absolutely separate them. Meadows in Grant County, July 29 (No. 1625).

Elymus striatus Willd. Sp. Pl. i, 470 (1797).
In shady places: Plummer Ford, July 3 (No. 1476).

Elymus canadensis L. Sp. Pl. i, 83 (1753).
The more typical form was collected at the Forks of Dismal River, July 13 (No. 1543). Another form with narrow, involute leaves and small spikes was growing common on the hills: Plummer Ford, July 13; Mullen, July 17; Middle Loup, July 26 (No. 1477). In a damp place at the foot of a sand hill near Middle Loup, Hooker County, July 22, a few specimens were found of a form which had spikes up to 2 or 3 dm. long, and leaves 10 or 12 mm. wide (No. 1806.) This has been called variety *robustus*, but without description.

Elymus virginicus L. Sp. Pl. i, 84 (1753).
This is a variety with a slender stem, the spike slender, upright but long-exserted. It resembles a form named in manuscript by Dr. Vasey *E. virginicus minor*, but it is intermediate between this and *E. canadensis intermedius*, from which it differs in having the flowers smooth and the lower glume as in *E. virginicus*. Rare: Mullen, July 17 (No. 1553).

Hordeum pusillum Nutt. Gen. i, 87 (1818).
I took this for *H. nodosum* L., but Mr. Dewey, of the United States Department of Agriculture, has pointed out a good and easy character by which to distinguish the two. In *H. nodosum*, the outer glumes are narrow, gradually acuminating upward; in *H. pusillum* they widen from a narrow base, and then acuminate abruptly into an awn. Prairies: Thedford, June 14 (No. 1267).

Hordeum jubatum L. Sp. Pl. i, 85 (1753).
This worthless grass was collected only near Natick, June 20 (No. 1367).

CONIFERÆ.

Juniperus virginiana L. Sp. Pl. ii, 1039 (1753).
Along Dismal River. Apparently, it has been rather common, but most of the trees are cut down. Plummer Ford, July 3; Dismal River, June 27 (No. 1428.)

SALVINIACEÆ.

Azolla caroliniana Willd. Sp. Pl. v, 541 (1810).
This interesting little plant was found in pools near a spring at Plummer Ford, August 24, growing together with *Lemna minor* and *L. perpusilla* (No. 1728).

OPHIOGLOSSACEÆ.

Botrychium virginianum (L.) Swartz, Schrad. Journ. Bot. ii, 111 (1800); *Osmunda virginianà* L. Sp. Pl. ii, 1064 (1753).

In woods, Plummer Ford, July 3; Forks of Dismal River, July 11 (No. 1467).

FILICES.

Onoclea sensibilis L. Sp. Pl. ii, 1062 (1753).

Natick, June 20; Plummer Ford, August 23 (No. 1377). Common among bushes along the rivers.

Dryopteris thelypteris (L.) Gray, Man. 630 (1848); *Acrostichum thelypteris* L. Sp. Pl. ii, 1071 (1753).

Common throughout in meadows; Halsey, September 11; South Dismal, August 12 to 14 (No. 1684).

Dryopteris spinulosa (Retz.) Kuntze, Rev. Gen. Pl. ii, 810 (1891); *Polypodium spinulosum* Retz. Fl. Scand. ed. 2, 250 (1795).

Rare, Plummer Ford, July 4 (No. 1484).

Dryopteris cristata (L.) Gray, Man. 631 (1848); *Polypodium cristatum* L. Sp. Pl. ii, 1090 (1753).

In damp places among trees, on the bank of Dismal River; at the Forks, July 12; South Dismal River, August 14 (No. 1530). New to the State of Nebraska.

Cystopteris fragilis (L.) Bernh. Schrad. Neues Journ. Bot. i, pt. 2, 27 (1806); *Polypodium fragile* L. Sp. Pl. ii, 1091 (1753).

On the wooded banks of Dismal River, Plummer Ford, July 3 (No. 1452).

Woodsia oregana Eaton, Can. Nat. ii, 90 (1865).

On the wooded hillsides near Plummer Ford, July 5 (No. 1479).

EQUISETACEÆ.

Equisetum arvense L. Sp. Pl. ii, 1061 (1753).

Only the sterile fronds, collected at Natick, June 20; Thedford, September 9 (No. 1378).

Equisetum variegatum Schleich. Cat. Pl. Helvet. 27 (1807).

On the banks of Middle Loup River north of Mullen, July 17 (No. 1801).

Equisetum lævigatum A. Br.; Engelm. Amer. Journ. Sci. xlvi, 87 (1844).

Two forms of this are found in Nebraska. The more common one corresponds to the description given in the manuals, except that it is often branching at the base, like the preceding. The spikes are narrow and often somewhat stalked. Thedford, June 14 (No. 1260). The other form nearly equals *E. robustum* in size, 6 to 10 dm. high; ridges with 2 lines of tubercles, sheath 8 to 12 mm. long widening upward, with a black margin and sometimes with a slightly brownish shade at the base. In meadows, Thedford, June 14 (No. 1283). This is said to be a good "hay grass."

Equisetum robustum A. Br.; Engelm. Amer. Journ. Sci. xlvi, 88 (1844).

On a hillside near Plummer Ford, August 24 (No. 1722).

CATALOGUE OF SPECIMENS.

Thedford, Thomas County, June 14.

1250. Carex douglasii Boott.
1251. Sisyrinchium bermudiana L.
1252. Nothocalais cuspidata (Pursh) Greene.
1253. Bulbilis dactyloides (Nutt.) Raf.
1254. Carex stenophylla Wahl.
1255. Linum rigidum Pursh.
1256. Prunus demissa (Nutt.) Walp.
1257. Lemna minor L.
1258. Spirodela polyrrhiza (L.) Schleid.
1259. Lappula redowskii occidentalis (Wats.) Rydberg.
1260. Equisetum lævigatum A. Br.
1261. Carex interior Bailey.
1262. Naumburgia thyrsiflora (L.) Duby.
1263. Abronia fragrans Nutt.
1264. Carex nebraskensis Dewey.
1265. Eleocharis palustris (L.) Rœm & Schult.
1266. Carex filiformis lanuginosa (Mx.) B. S. P.
1267. Hordeum pusillum Nutt.
1268. Carex scoparia Schk.
1269. Panicularia nervata (Willd.) Kuntze.
1270. Poa arida Vasey.
1271. Poa arida Vasey.
1272. Poa sp.
1273. Kœleria cristata (L.) Pers.
1274. Carex marcida Boott.
1275. Poa pratensis L.
1276. Scirpus lacustris L.
1277. Carex hystricina Muhl.
1278. Poa pratensis L.
1279. Panicum scoparium Lam.
1280. Triglochin maritima L.
1281. Lesquerella argentea (Pursh) MacMillan.
1282. Festuca octoflora Walt.
1283. Equisetum lævigatum A. Br.
1284. Pentstemon angustifolius Pursh.
1285. Spiesia lambertii (Pursh) Kuntze.
1286. Poa arida Vasey.
1287. Physalis heterophylla Nees.
1288. Rumex venosus Pursh.

Thedford, Thomas County, June 15.

1289. Prunus americana Marsh.
1290. Allium mutabile Mx.
1291. Amaranthus blitoides Wats.
1292. Antennaria plantaginifolia (L.) Richards.
1293. Œnothera albicaulis Pursh.
1294. Plantago purshii Rœm. & Schult.
1295. Alsine longifolia (Muhl.) Britton.
1296. Carex aurea Nutt.
1297. Habenaria hyperborea (L.) R. Br.
1298. Carex stipata Muhl.
1299. Androsace occidentalis Pursh.
1300 Aristida fasciculata Torr.
1301. Macrocalyx nyctalea (L.) Kuntze.
1302. Œnothera sinuata L.
1303. Œnothera serrulata Nutt.
1304. Lepidium intermedium Gray.
1305. Acerates viridiflora lanceolata (Ives) Torr.
1306. Verbena bracteosa Mx.
1307. Cryptanthe crassisepala (Torr. & Gray) Greene.
1308. Panicum wilcoxianum Vasey.
1309. Veronica peregrina L.
1310. Plantago purshii Rœm. & Schult.
1311. Senecio compactus (Gray) Rydberg.
1312. Hedeoma hispida Pursh.
1313. Rosa fendleri Crepin.
1314. Amorpha fruticosa L.
1315. Salix fluviatilis Nutt.
1316. Pentstemon albidus Nutt.
1317. Carex marcida Boott.
1318. Juncus tenuis Willd.
1319. Scirpus americanus Pers.

Thedford, Thomas County, June 16.

1320. Lathyrus ornatus Nutt.
1321. Hymenopappus filifolius Hook.
1322. Astragalus ceramicus longifolius (Pursh) Rydberg.
1323. Thalesia fasciculata (Nutt.) Britton.
1324. Prunus besseyi Bailey.
1325. Ceanothus ovatus Desf.
1326. Acerates lanuginosa (Nutt.) Dec.
1327. Psoralea lanceolata Pursh.
1328. Medicago sativa L.
1329. Salix cordata angustata (Pursh) Anders.
1330. Physalis lanceolata Pursh.
1331. Mimulus glabratus jamesii (Torr. & Gr.) Gray.
1332. Veronica americana Schwein.
1333. Ranunculus sceleratus L.
1334. Cyrtorrhyncha cymbalaria (Pursh) Britton.
1335. Batrachium divaricatum (Schrank) Wimm.
1336. Viola obliqua Hill.
1337. Eleocharis acicularis (L.) Rœm. & Schult.
1338. Utricularia vulgaris L.
1339. Sparganium eurycarpum Engelm.

Thedford, Thomas County, June 17.

1340. Vagnera stellata (L.) Morong.
1341. Psoralea digitata Nutt.
1342. Castilleja sessiliflora Pursh.
1343. Gaura coccinea Pursh.
1344. Stipa comata Trin.
1345. Commelina virginica L.
1346. Legouzia perfoliata (L.) Britton.
1347. Prunella vulgaris L.
1348. Oxalis stricta L.
1349. Silene anthirrhina L.
1350. Erigeron bellidiastrum Nutt.
1351. Chenopodium leptophyllum subglabrum Wats.
1352. Ceanothus ovatus pubescens Wats.
1353. Apocynum cannabinum L.
1354. Rosa fendleri Crepin.
1355. Lithospermum gmelini (Mx.) Hitchcock.
1356. Carduus plattensis Rydberg.
1357. Malvastrum coccineum (Nutt.) Gray.

Thedford, Thomas County, June 19.

1358. Argemone albiflora Hornem.
1359. Yucca glauca Nutt.
1360. Delphinium carolinanum Walt.
1361. Linum rigidum Pursh.
1362. Helianthus petiolaris Nutt.
1363. Comandra pallida A. DC.

Natick, Thomas County, June 20.

1364. Geum strictum Ait.
1365. Onosmodium molle Mx.
1366. Ribes aureum Pursh.
1367. Hordeum jubatum L.
1368. Panicum dichotomum L.
1369. Juncus nodosus L.
1370. Amaranthus torreyi (Gray) Benth.
1371. Cyperus schweinitzii Torr.
1372. Euphorbia petaloidea Engelm.
1373. Euphorbia glyptosperma Engelm.
1374. Juncus tenuis Willd.
1375. Parthenocissus quinquefolia (L.) Planch.
1376. Juncus balticus montanus Engelm.
1377. Onoclea sensibilis L.
1378. Equisetum arvense L.
1379. Cactus viviparus Nutt.
1380. Tradescantia virginiana L.
1381. Catabrosa aquatica (L.) Beauv.
1382. Carex pennsylvanica Lam.

Thedford, Thomas County, June 21.

1383. Asclepias speciosa Torr.
1384. Glycyrrhiza lepidota Pursh.
1385. Solanum nigrum L.
1386. Chenopodium leptophyllum Wats.
1387. Monarda citriodora Cerv.
1388. Scirpus lacustris occidentalis Wats.
1389. Lithospermum angustifolium Mx.
1390. Psoralea argophylla Pursh.
1391. Fraxinus pennsylvanica lanceolata (Borckh.) Sargent.
1392. Rosa arkansana Porter.
1393. Solanum triflorum Nutt.
1394. Chenopodium fremontii incanum Wats.
1395. Lepachys columnaris (Pursh) Torr. & Gray.
1396. Potamogeton pusillus L.
1397. Lemna trisulca L.
1398. Physalis heterophylla umbrosa Rydberg.
1399. Carex teretiuscula Good.
1400. Panicularia nervata (Willd.) Kuntze.
1401. Juncus balticus montanus Engelm.
1402. Stipa spartea Trin.
1403. Eriocarpum spinulosum (Pursh) Greene.

Norway, Thomas County, June 22.

1404. Bromus ciliatus L.
1405. Arabis hirsuta (L.) Scop.
1406. Acer negundo L.
1407. Rhus trilobata Nutt.
1408. Polygonatum biflorum commutatum (Rœm. & Schult.) Morong.
1409. Calamagrostis robusta Vasey.
1410. Celtis occidentalis L.
1411. Populus deltoides Marsh.
1412. Salix cordata angustata (Pursh) Anders.
1413. Thalictrum purpurascens L.
1414. Cornus stolonifera Mx.
115. Ribes floridum L'Her.
1416. Rhus radicans toxicodendron (L.) Pers.
1417. Amorpha canescens Pursh
1418. Galium trifidum L.

Norway, Thomas County, June 23.

1419. Astragalus [illegible] assicarpus N
1420. Acerate [illegible] olia (Nutt.) Dec.
1421. Potamogeton lonchites Tuckerm.
1422. Verbena stricta Vent.
1423. Acerates viridiflora linearis Gray.
1424. Acerates viridiflora (Raf.) Ell.
1425. Typha latifolia L.

Dismal River, Thomas County, June 27.

1426. Calamagrostis neglecta (Ehrh.) Gærtn.
1427. Scirpus atrovirens pallidus Britton.
1428. Juniperus virginiana L.
1429. Cryptanthe fendleri (Gray) Greene.
1430. Croton texensis (Klotzsch) Muell.
1431. Anemone cylindrica Gray.
1432. Lygodesmia juncea (Pursh) Don.
1433. Allionia hirsuta Pursh.
1434. Agropyron repens glaucum (Desf.) Scribner
1435. Cornus stolonifera Mx.
1436. Eleocharis palustris glaucescens (Willd.) Gray.
1437. Galium aparine L.
1438. Agrostis hiemalis (Walt.) B. S. P.
1439. Potamogeton interruptus Kitaibel.
1440. Potamogeton amplifolius Tuckerm.
1441. Juncus nodosus L.

Dismal River, Thomas County, June 28.

1442. Symphoricarpos occidentalis Hook.
1443. Rhus glabra L.
1444. Thelesperma gracile (Torr.) Gray.
1445. Lepachys columnaris pulcherrima (Don) Torr. & Gr.
1446. Eriophorum gracile Koch.
1447. Opuntia humifusa Raf.

Dismal River, Thomas County, June 29.

1448. Vitis vulpina L.
1449. Andropogon hallii Hack.
1450. Chenopodium fremontii Wats.

Plummer Ford, Dismal River, Thomas County, July 3.

1451. Erigeron ramosum beyrichii (Fisch. & Mey.) Smith & Pound.
1452. Cystopteris fragilis (L.) Bernh.
1453. Celastrus scandens L.
1454. Erysimum cheiranthoides L.
1455. Smilax herbacea L.
1456. Geum canadense Jacq.
1457. Campanula aparinoides Pursh.
1458. Geum macrophyllum Willd.
1459. Panicularia aquatica (L.) Kuntze.
1460. Gaura parviflora Dougl.
1461. Carex laxiflora varians Bailey.
1462. Sanicula canadensis L.
1463. Circæa lutetiana L.
1464. Juncus tenuis Willd.
1465. Rubus occidentalis L.
1466. Vitis vulpina L.
1467. Botrychium virginianum (L.) Swartz,

1468. Lythrum alatum Pursh.
1469. Potentilla monspeliensis L.
1470. Rudbeckia hirta L.
1471. Lychnis drummondii (Hook.) Wats.
1472. Kuhnistera purpurea (Vent.) MacMillan.
1473. Parietaria pensylvanica Muhl.
1474. Potentilla simplex Pursh.
1475. Lappula deflexa americana (Nutt.) Greene.
1476. Elymus striatus Willd.
1477. Elymus canadensis L.
1478. Carex longirostris Torr.; Schwein.
1479. Woodsia oregana Eaton.
1480. Kuhnistera candida occidentalis Rydberg.
1481. Fragaria vesca americana Porter.
1482. Oryzopsis micrantha (Trin. & Rupr.) Thurber.

Plummer Ford, Dismal River, Thomas County, July 4.

1483. Polygonatum biflorum (Walt.) Ell.
1484. Dryopteris spinulosa (Retz.) Kuntze.
1485. Eleocharis palustris (L.) Rœm. & Schult.
1486. Eatonia obtusata (Mx.) Gray.
1487. Juncus tenuis Willd.
1488. Alopecurus geniculatus fulvus (Smith) Scribner.
1489. Agrostis hiemalis (Walt.) B. S. P.
1490. Scutellaria galericulata L.
1491. Cicuta virosa maculata (L.) Coult. & Rose.
1492. Agrostis exarata Trin.
1493. Panicum scoparium Lam.
1494. Calamagrostis neglecta (Ehrh.) Gærtn.
1495. Agrimonia striata Mx.

Plummer Ford, Dismal River, Thomas County, July 5.

1496. Allionia nyctaginea Mx.
1497. Berula erecta (Huds.) Coville.
1498. Salix cordata Muhl.
1499. Bouteloua curtipendula (Mx.) Torr.
1500. Asclepias arenaria Torr.
1501. Opuntia polyacantha Haw.
1502. Collomia linearis Nutt.
1503. Lemna gibba L.
1504. Euphorbia geyeri Engelm.
1505. Lacinaria squarrosa (L.) Hill.
1506. Pentstemon haydeni Wats.
1507. Lactuca ludoviciana (Nutt.) DC.
1508. Arabis glabra (L.) Bernh.
1509. Allionia hirsuta Pursh.
1510. Œnothera rhombipetala Nutt.

Plummer Ford, Dismal River, Thomas County, July 8.

1511. Ipomœa leptophylla Torr.
1512. Kuhnistera candida multiflora (Nutt.) Rydberg.
1513. Acnida tuberculata Moq.
1514. Oreocarya suffruticosa (Torr.) Greene.

Forks of Dismal River, Hooker County, July 11.

1515. Verbena hastata L.
1516. Agropyron tenerum Vasey.
1517. Berula erecta (Huds.) Coville.
1518. Asclepias incarnata L.
1519. Galium triflorum Mx.
1520. Urtica gracilis Ait.
1521. Polygonum convolvulus L.
1522. Eragrostis major Host.
1523. Ribes gracile Mx.
1524. Chenopodium album L.
1525. Chenopodium hybridum L.
1526. Opuntia polyacantha Haw.
1527. Euphorbia glyptosperma Engelm.
1528. Cratægus coccinea L.

Forks of Dismal River, Hooker County, July 12.

1529. Phryma leptostachya L.
1530. Dryopteris cristata (L.) Gray.
1531. Monarda fistulosa L.
1532. Asclepias syriaca L.
1533. Sagittaria latifolia Willd.
1534. Munroa squarrosa (Nutt.) Torr.
1535. Polygonum aviculare L.
1536. Erigeron bellidiastrum Nutt.
1537. Astragulus carolinianus L.

Forks of Dismal River, Hooker County, July 13.

1538. Panicum capillare L.
1539. Humulus lupulus L.
1540. Ulmus americana L.
1541. Ulmus americana L.
1542. Chenopodium album L.
1543. Elymus canadensis L.
1544. Œnothera pallida latifolia Rydberg.
1545. Euphorbia hexagona Nutt.
1546. Agrostis alba L.
1547. Astragalus lotiflorus Hook.

Middle Loup, north of Mullen, Hooker County, July 17.

1548. Cenchrus tribuloides L.
1549. Sporobolus cryptandrus robustus Vasey.
1550. Oryzopsis membranacea (Pursh) Vasey.
1551. Muhlenbergia pungens Thurb.
1552. Bouteloua hirsuta Lag.
1553. Elymus virginicus L.
1554. Hymenopappus filifolius Hook.
1555. Lactuca ludoviciana (Nutt.) DC.
1556. Epilobium adenocaulon Haussk.
1557. Calamagrostis neglecta (Ehrh.) Gærtn
1558. Urtica gracilis Ait.
1559. Ranunculus pennsylvanicus L. f.
1560. Kœllia lanceolata (Willd.) Kuntze.
1561. Panicum virgatum L.
1562. Sagittaria latifolia Willd.
1563. Sagittaria latifolia Willd.

Middle Loup, north of Mullen, Hooker County, July 18.

1564. Verbena hastata × stricta Rydberg.
1565. Meibomia canadensis (L.) Kuntze.
1566. Portulaca oleracea L.
1567. Fagopyrum fagopyrum (L.) Karst.
1568. Chamæraphis viridis (L.) Porter.
1569. Eragrostis tenuis (Ell.) Gray.
1570. Lactuca pulchella (Pursh) DC.
1571. Polygonum lapathifolium L.
1572. Rumex persicarioides L.
1573. Œnothera biennis parviflora (L.) Torr. & Gr.
1574. Bouteloua oligostachya (Nutt.) Torr.
1575. Juncus torreyi Coville.

1576. Epilobium adenocaulon Haussk.
1577. Spartina cynosuroides (L.) Willd.
1578. Œnothera biennis L.
1579. Polygonum ramosissimum Mx.

Middle Loup, north of Mullen, Hooker County, July 19.

1580. Eriogonum annuum Nutt.
1581. Salix cordata vestita Anders.
1582. Paspalum setaceum ciliatifolium (Mx.) Vasey.
1583. Redfieldia flexuosa (Thurb.) Vasey.
1584. Lygodesmia rostrata Gray.
1585. Cycloloma atriplicifolium (Spreng.) Coulter.
1586. Œnothera pallida Lindl.

Middle Loup, north of Mullen, Hooker County, July 20.

1587. Cleome serrulata Pursh.
1588. Eragrostis major Host.

Middle Loup, north of Mullen, Hooker County, July 24.

1589. Kuhnistera villosa (Nutt.) Kuntze.
1590. Panicum crus-galli L.
1591. Polygonum pennsylvanicum L.
1592. Lotus americanus (Nutt.) Bisch.
1593. Salsola kali tragus (L.) Moq.
1594. Frœlichia floridana (Nutt.) Moq.
1595. Andropogon hallii muticus Hack.
1596. Andropogon hallii Hack.
1597. Panicum virgatum L.
1598. Stipa viridula Trin.
1599. Cyperus aristatus Rottb.

Forks of Middle Loup, Hooker County, July 26.

1600. Elymus canadensis L.
1601. Ribes aureum Pursh.
1602. Polygonum punctatum leptostachyum (Meisn.) Small.
1603. Epilobium linearo Muhl.
1604. Panicum scoparium Lam.

Forks of Middle Loup, Hooker County, July 27.

1605. Gilia longiflora (Torr.) Don.
1606. Rosa fendleri Crepin.
1607. Andropogon hallii Hack.
1608. Geum canadense Jacq.
1609. Adicea pumila (L.) Raf.
1610. Teucrium occidentale Gray.
1611. Potentilla pennsylvanica strigosa Pursh.

Headwaters of South Fork of Middle Loup, north-east of Whitman, Grant County, July 29.

1612. Scripus fluviatilis (Torr.) Gray.
1613. Polygonum emersum (Mx.) Britton.
1614. Amaranthus albus L.
1615. Sium cicutæfolium Gmel.
1616. Alisma plantago L.
1617. Agropyron caninum (L.) Rœm & Schult.
1618. Andropogon provincialis Lam.
1619. Agropyron violaceum majus Vasey.
1620. Calamagrostis canadensis (Mx.) Beauv.
1621. Phalaris arundinacea L.
1622. Carex trichocarpa aristata (R. Br.) Bailey.
1623. Distichlis spicata stricta (Torr.) Scribner.
1624. Beckmannia erucæformis (L.) Host.
1625. Elymus macounii Vasey.
1626. Roripa obtusa (Nutt.) Britton.
1627. Helianthus scaberrimus Ell.

Headwaters of South Fork of Middle Loup, north-east of Whitman, Grant County, July 31.

1628. Mentha canadensis L.
1629. Polygonum lapathifolium L.
1630. Zizania aquatica L.
1631. Phragmites phragmites (L.) Karst.
1632. Solidago missouriensis Nutt.
1633. Chrysopsis villosa (Pursh) Nutt.

Headwaters of South Fork of Middle Loup, north-east of Whitman, Grant County, August 1.

1634. Cuscuta indecora pulcherrima (Scheele) Engelm.
1635. Helianthus petiolaris patens (Lehm.) Rydberg.
1636. Kuhnia glutinosa Ell.
1637. Lobelia spicata hirtella Gray.
1638. Andropogon nutans avenaceum (Mx.) Hack.
1639. Cuscuta cuspidata Engelm.

Camp, 15 miles south of Whitman, August 3.

1640. Helianthus maximiliani Schrad.
1641. Lycopus virginicus L.
1642. Bidens trichosperma tenuiloba (Gray) Britton.
1643. Panicum crus-galli L.
1644. Homalocenchrus oryzoides (L.) Poll.

Haney's ranch, August 4.

1645. Hippuris vulgaris L.
1646. Carex pseudo-cyperus L.

Haney's ranch, August 5.

1647. Corispermum hyssopifolium L.
1648. Solidago serotina Ait.

Swan Lake, August 7.

1649. Polygonum hartwrightii Gray.
1650. Nymphæa advena Soland.
1651. Myriophyllum spicatum L.
1652. Potamogeton natans L.
1653. Polygonum amphibium L.

Cody's Lakes, August 9.

1654. Cyperus strigosus L.
1655. Lycopus sinuatus Ell.
1656. Hypericum canadense L.
1657. Sporobolus asperifolius (Nees. & Meyen.) Thurber.
1658. Lycopus lucidus Turcz.
1659. Potamogeton pectinatus L.
1660. Naias flexilis (Willd.) Rostk. & Schmidt.
1661. Zanichellia palustris L.
1662. Solidago canadensis gilvocanescens Rydberg.
1663. Solidago nemoralis Ait.
1664. Cristatella jamesii Torr. & Gr.
1665. Andropogon scoparius Mx.

Cody's Lakes, August 10.

1666. Solidago rigida L.
1667. Ambrosia artemisiæfolia L.
1668. Ambrosia psilostachya DC.
1669. Helianthus giganteus L.
1670. Rumex britannica L.

1671. Gerardia tenuifolia Vahl.
1672. Polygonum punctatum leptostachyum (Meisn.) Small.
1673. Helianthus maximiliani Schrad.
1674. Acnida tuberculata Moq.
1675. Xanthium canadense Mill.

South Dismal River, August 11.

1676. Helianthus annuus L.
1677. Senecio douglasii DC.
1678. Erigeron canadensis L.
1679. Polygonum scandens L.
1680. Lobelia syphilitica L.

South Dismal River, August 12.

1681. Impatiens biflora Walt.
1682. Eupatorium purpureum L.
1683. Eupatorium perfoliatum L.
1684. Dryopteris thelypteris (L.) Gray.
1685. Carduus altissimus L.
1686. Muhlenbergia mexicana (L.) Trin.
1687. Phaseolus pauciflorus Benth.

South Dismal River, August 14.

1688. Cuscuta coryli Engelm.
1689. Mentzelia nuda (Pursh) Torr. & Gray.
1690. Helenium autumnale L.
1691. Scutellaria lateriflora L.
1692. Meibomia canadensis (L.) Kuntze.
1693. Prunus americana Marsh.

Mullen, Hooker County, August 17.

1694. Cuscuta indecora pulcherrima (Scheele) Engelm.
1695. Amaranthus blitoides Wats.
1696. Bidens lævis (L.) B. S. P.
1697. Sporobolus cryptandrus (Torr.) Gray.
1698. Sieglingia pupurea (Walt.) Kuntze.

Thedford, Thomas County, August 19.

1699. Erigeron canadensis L.
1700. Asclepias verticillata pumila Gray.
1701. Aster junceus Ait.
1702. Lycopus lucidus Turcz.
1703. Elodes virginica (L.) Nutt.
1704. Muhlenbergia mexicana (L.) Trin.
1705. Sporobolus cryptandrus (Torr.) Gray.
1706. Lacinaria punctata (Hook.) Kuntze.
1707. Bidens frondosa L.
1708. Polygonum sagittatum L.
1709. Muhlenbergia racemosa (Mx.) B. S. P.
1710. Schedonnardus paniculatus (Nutt.) Trelease.
1711. Eragrostis pectinacea (Mx.) Steudel.
1712. Fimbristylis castanea (Mx.) Vahl.
1713. Leptochloa fascicularis (Lam.) Gray.

Plummer Ford, Thomas County, August 22.

1714. Apios apios (L.) MacMillan.
1715. Falcata pitcheri (Torr. & Gr.) Kuntze.
1716. Verbena urticifolia L.
1717. Clematis ligusticifolia Nutt.
1718. Cyperus diandrus Torr.

Plummer Ford, Thomas County, August 23.

1719. Gyrostachys cernuua (L.) Kuntze.
1720. Cardamine hirsuta L.
1721. Aster canescens Pursh.

Plummer Ford, Thomas County, August 24.

1722. Equisetum robustum A. Br.
1723. Lemna perpusilla Torr.
1724. Carduus altissimus L.

Thedford, Thomas County, August 26.

1725. Artemisia gnaphalodes Nutt.
1726. Melilotus alba Desr.
1727. Datura tatula L.

Plummer Ford, August 24.

1728. Azolla caroliniana Willd.

Thedford, Thomas County, August 26.

1729. Raphanus sativus L.
1730. Artemisia canadensis Mx.
1731. Aster multiflorus Ait.
1732. Talinum teretifolium Pursh.

Thedford, Thomas County, September 7.

1733. Artemisia frigida Willd.
1734.
1735. Aster novæ-angliæ L.
1736. Gentiana andrewsii Griseb.
1737. Cicuta bulbifera L.
1738. Euthamia graminifolia (L.) Nutt.
1739. Aster salicifolius subasper (Lindl.) Gray.
1740. Iva xanthifolia Nutt.

Thedford, Thomas County, September 9.

1741. Sporobolus filiformis (Thurb.) Rydberg
1742. Euphorbia glyptosperma Engelm.
1743. Aster oblongifolius rigidus Gray.
1744. Euphorbia petaloidea Engelm.

Halsey and Natick, Thomas County, September 11.

1745. Bœhmeria cylindrica (L.) Willd.
1746. Lespedeza capitata sericea Hook.
1747. Cyperus houghtonii Torr.
1748. Aster umbellatus pubens Gray.
1749. Falcata comosa (L.) Kuntze.
1750. Solidago missouriensis Nutt.
1751. Solidago nemoralis Ait.
1752. Aster multiflorus stricticaulis Torr. & Gray.
1753. Euphorbia geyeri Engelm.
1754. Aster multiflorus incano-pilosus (Lindl.) Rydberg.

Thedford, Thomas County, September 12.

1755. Lactuca canadensis L.
1756. Muhlenbergia mexicana (L.) Trin.
1757. Solidago canadensis L.
1758. Solanum rostratum Dunal.
1759. Sporobolus filiformis (Thurb.) Rydberg.
1760. Grindelia squarrosa (Pursh) Dunal.

Thedford, Thomas County, September 13.

1761. Lacinaria punctata (Hook.) Kuntze.
1762. Muhlenbergia racemosa (Mx.) B. S. P.
1763. Polygonum camporum Meisn.
1764. Muhlenbergia mexicana (L.) Trin.

Mullen, Hooker County, September 14.

1765. Aster multiflorus incano-pilosus (Lindl.) Rydberg.
1766. Chrysopsis villosa (Pursh) Nutt.
1767. Helianthus grosse-serratus Martens.

1768. Polygonum ramosissimum Mx. (form).
1769. Polygonum ramosissimum Mx.
1770. Solidago mollis Bartl.

Mullen, Hooker County, September 15.

1771. Polygonum litorale Link.
1772. Polygonum aviculare L.
1773. Mollugo verticillata L.
1774. Eragrostis caroliniana (Spreng.) Scribner.
1775. Bromus ciliatus porteri Rydberg.
1776. Prunus americana Marsh.

Seneca, Thomas County, September 16.

1777. Gaura biennis L.

Whitman, Grant County, September 19.

1778. Acnida tuberculata Moq.
1779. Artemisia biennis L.
1780. Aster oblongifolius Nutt.
1781. Chrysopsis villosa (Pursh) Nutt.
1782. Chenopodium rubrum L.
1783. Iva xanthifolia Nutt.
1784. Myriophyllum spicatum L.
1785. Myriophyllum spicatum L.
1786. Naias guadalupensis (Spreng.) Morong.
1787. Roripa palustris hispida (Desv.) Rydberg.
1788. Panicum capillare L.
1789. Ranunculus sp.
1790. (?) Urtica dioica L.

Whitman, Grant County, September 20.

1791. Chenopodium rubrum L.
1792. Potomogeton perfoliatus L.
1793. Polygonum hartwrightii Gray.
1794. Polygonum lapathifolium L.
1795. Scolochloa festucacea (Willd.) Link

The following did not receive any number in the field, but were numbered afterwards:

1796. Agropyron repens glaucum (Desf.) Scribner, June 16.
1797. (?) Carex rigida goodenovii (Gay) Bailey, June 22.
1798. Amaranthus retroflexus L., July 18.
1799. Allionia hirsuta Pursh, July 18.
1800. Agrostis exarata Trin., July 17.
1801. Equisetum variegatum Schleich., July 17.
1802. Andropogon hallii flaveolus Hack., July 24.
1803. Bouteloua oligostachya (Nutt.) Torr., July 24.
1804. Calamovilfa longifolia (Hook.) Hack., July 22.
1805. Carex marcida Boott, July 24.
1806. Elymus canadensis L., July 22.
1807. Eatonia obtusata robusta Vasey, July 17.
1808. Physalis heterophylla Nees, July 23.
1809. Sagittaria arifolia Nutt., July 26.
1810. Allionia hirsuta Pursh, July 27.
1811. Sagittaria arifolia Nutt., July 27.
1812. Sagittaria latifola Willd., July 27.
1813. Andropogon provincialis pycnanthus Hack., July 31.
1814. Distichlis spicata stricta (Torr.) Scribner, July 31.
1815. Galium trifidum latifolium Torr., July 31.
1816. Carex filiformis lanuginosa (Mx.) B. S. P., Aug. 4.
1817. Juncus torreyi Coville, Aug. 4.
1818. Lobelia spicata hirtella Gray, Aug. 1.
1819. Potentilla pentandra, Engelm., Aug. 4.
1820. Polygonum ramosissimum Michx., Aug. 4.
1821. Urtica gracilis Ait., Aug. 4.
1822. Polygonum emersum (Mx.) Britton, Aug. 7.
1823. Ceratophyllum demersum L., Aug. 7.
1824. Ambrosia psilostachya DC., Aug. 10.
1825. Helianthus sp., Aug. 10.
1826. Hypericum canadense majus Gray, Aug. 11.
1827. Juncus marginatus Rostk., Aug. 9.
1828. Naias flexilis (Willd.) Rostk. & Schmidt, Aug. 11.
1829. Eragrostis tenuis (Ell.) Gray, Aug. 10.
1830. Lycopus virginicus L., Aug. 17.
1831. Eragrostis tenuis (Ell.) Gray, Aug. 22.
1832. Eragrostis tenuis (Ell.) Gray, Aug. 23.
1833. Euphorbia serpyllifolia Pers., Sept. 15.
1834. Aster canescens viscosus Gray, Sept. 18.
1835. Chenopodium leptophyllum Nutt., July 17.
1836. Chenopodium leptophyllum oblongifolium Wats., July 24.
1837. Draba caroliniana micrantha (Nutt.) Gray, June 15.
1838. Frœlichia floridana (Nutt.) Moq., Aug. 21.
1839. Fraxinus pennsylvanica Marsh., June 21.
1840. Galium trifidum L., June 26.
1841. Juncus tenuis Willd., July 18.
1842. Agrostis exarata Trin., July 3.
1843. Œnothera pallida latifolia Rydberg, July 17.
1844. Koeleria nitida Nutt., Sept. 9.
1845. Juncus tenuis Willd., July 3.
1846. Potamogeton lonchites Tuckerm., June 27.
1847. Aristida basiramea Engelm., July —.
1848. Rosa fendleri, Crepin, June 20 and 27.
1849. Rosa fendleri Crepin, Aug. 17.
1850. Kuhnistera candida multiflora (Nutt.) Rydberg, July 17.
1851. Geum strictum Ait. (form), July 17.

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U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF BOTANY.

CONTRIBUTIONS

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REPORT ON A COLLECTION OF PLANTS MADE BY J. H. SANDBERG AND ASSISTANTS IN NORTHERN IDAHO IN THE YEAR 1892.

BY

JOHN M. HOLZINGER.

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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF BOTANY,
Washington, D. C., June 21, 1895.

SIR: I have the honor to transmit herewith, for publication as Volume III, No. 4, of Contributions from the United States National Herbarium, a report prepared by Mr. John M. Holzinger, formerly assistant botanist, on a collection of plants made in northern Idaho in 1892 by Dr. J. H. Sandberg, Mr. D. T. MacDougal, and Mr. A. A. Heller, who were employed for this purpose by the Department of Agriculture.

Respectfully,

FREDERICK V. COVILLE,
Chief of the Division of Botany.

HON. J. STERLING MORTON,
Secretary, United States Department of Agriculture.

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REPORT ON A COLLECTION OF PLANTS MADE BY J. H. SANDBERG AND ASSISTANTS IN NORTHERN IDAHO, IN THE YEAR 1892.

By JOHN M. HOLZINGER.

INTRODUCTORY STATEMENT.

The subject of this report is a collection of plants made in the season of 1892 by Dr. J. H. Sandberg, assisted by Mr. D. T. MacDougal and Mr. A. A. Heller, principally in northern Idaho, but to some extent in the adjacent parts of Washington and Montana. The party were commissioned by the Department of Agriculture to proceed "into the field in northern Idaho and eastern Washington for the collection of the flora of that region."

The first camp was pitched 8 miles above Lewiston in the valley of the Clearwater, on the north side of the river at the Upper Ferry. There the party remained from April 23 to May 17, collecting in the surrounding region the plants numbered 1 to 193. The localities explored from Camp 1 were the valley of Clearwater River; the valleys of Hatwai Creek and Snake River to the west of the camp; of Big Potlatch River, a northern tributary of the Clearwater, east of the camp; of Peter Creek, another small tributary, 2 miles east of the camp; and the vicinity of Lapwai Agency, the same distance to the southeast.

The second camp was located in the neighborhood of Lake Waha, some 20 miles south of Camp 1. The party remained in that vicinity from May 20 to May 28, collecting the plants numbered 194 to 263. The Lake Waha region and Wiessners Peak were the principal localities visited from this camp.

Camp 3 was in the valley of Big Potlatch River, about 4 miles from its entrance into Clearwater River, on the north side of the latter. The party remained in this vicinity until June 10, collecting plants numbered 264 to 375. Collections were made in the valley of Big Potlatch River, the trips extending as far north as Julietta, Latah County, and some distance up Little Potlatch River, tributary to the Big Potlatch at Julietta. The collecting grounds of Camp 1 were also revisited from this point.

Camp 4 was pitched some 15 miles south of Moscow, Latah County, in the valley of Little Potlatch River, on the south side of the stream.

The stay at this camp was from June 13 to June 18, the plants collected being numbered 376 to 430. The excursions extended throughout the valley of Little Potlatch River, northward to within 5 miles of Moscow.

Camp 5 was situated at the head of Little Potlatch River, 5 miles south of Moscow, Latah County. The party remained there from June 18 to June 21, collecting plants numbered 431 to 478. From this point the party explored the region around Moscow, going as far northeast as Cedar Mountain.

Camp 6 was 3 miles south of Viola, Latah County. The party remained in that vicinity from June 23 to June 26, collecting plants numbered 479 to 506. The region explored was the country around Viola, reaching to the Kamyak Buttes, 7 miles west, in Washington.

Camp 7 was pitched 4 miles east of Farmington, Latah County. The party remained there from June 26 to July 1, collecting plants numbered 507 to 530. The principal localities visited were Farmington and vicinity, Pine Creek, and the north fork of Hangman's Creek, a tributary to Latah Creek, running northeast of the camp. Pine Creek runs through Farmington, having its source 3 to 4 miles east of that city.

Camp 8 was located on the south shore of Lake Cœur d'Alene, near Farmington Landing, Kootenai County. The party operated from this point from July 1 to July 14, collecting plants numbered 531 to 649 and No. 661. The explorations from this camp covered the region around Farmington Landing, and around Harrison, near the mouth of the Cœur d'Alene River.

Camp 9 was located in the valley of Spokane River, near Post Falls, Kootenai County. The time spent there extended from July 15 to July 18, and the plants collected were numbered 650 to 669, except No. 661. The region explored was principally the valley of Spokane River.

Camp 10 was situated a short distance to the north of Rathdrum, Kootenai County. The time occupied in the vicinity of this camp was from July 20 to July 25. The plants collected were numbered 670 to 740. The region explored was the vicinity of Rathdrum, Lake Tesemini, and Mud Lake. Another collection was made near Rathdrum, August 12 to 15. The plants there collected were numbered 892 to 894.

Camp 11 was located at or near the south end of Lake Pend d'Oreille, Kootenai County. The party worked from this camp as a basis from July 27 to August 10, collecting numbers 741 to 891. The principal points of exploration were the southern part of the valley of Lake Pend d'Oreille, the vicinity of Granite Station, on the railroad a few miles west of the camp, the vicinity of Lake View, on the east shore of the lake, and Packsaddle Peak, one of the heights of Bitter Root Mountains, a little south of the forty-eighth meridian.

The following smaller collections were made during the trips necessary for securing supplies and on the homeward journey: Near Spo-

kane, Wash., from August 15 to 18, Nos. 895 to 930, and Nos. 1027 and 1028; in the valley of Lake Pend d'Oreille, on a second visit to the locality August 20 to 25, Nos. 931 to 970; near Hope, Kootenai County, August 26, Nos. 1023 to 1026, and No. 1029; near Thompson Falls, Mont., August 28, No. 1030; near Bonner, Missoula County, Mont., August 30 and 31, Nos. 982 to 992; near Colgate, close by Glendive, Dawson County, Mont., September 4 to 6, Nos. 993 to 1022, and 1033 to 1035.

Acknowledgment for aid in the preparation of this report is made as follows: To Mr. E. P. Sheldon, in *Astragalus;* Dr. J. N. Rose, in *Umbelliferæ;* Mr. G. B. Sudworth, in *Coniferæ;* Mr. M. S. Bebb, in *Salix;* Mr. Frederick V. Coville, in *Juncaceæ;* Mr. C. F. Wheeler, in *Cyperaceæ;* Mr. L. H. Dewey, in *Gramineæ;* Mr. L. M. Underwood, in *Pteridophyta;* Mrs. E. G. Britton, Mr. J. Cardot, and Dr. Warnstorf, in *Musci;* and Messrs. J. B. Ellis, B. M. Everhart, and J. F. James, in *Fungi.*

CATALOGUE OF SPECIES.

RANUNCULACEÆ.

Clematis douglasii Hook. Fl. Bor. Amer. i, 1, t. 1 (1829).

Dry soil, valley of Big Potlatch River, Nez Perces County; June 6 (No. 320).

Clematis ligusticifolia Nutt; Torr. & Gr. Fl. i, 9 (1838).

Common on banks at the Upper Ferry, Clearwater River, above Lewiston, Nez Perces County; May 31 (No. 282).

Atragene americana Sims, Bot. Mag. t. 887 (1806); *Clematis verticillaris* DC. Syst. i, 166 (1818).

Occasional on moist woody slopes, Craig Mountains, vicinity of Lake Waha, Nez Perces County; May 23 (No. 233).

Thalictrum occidentale Gray, Proc. Amer. Acad. viii, 372 (1872).

Large plants with 8 to 12 pistils in a flower, i. e., about double the number stated in Coulter's Flora of the Rocky Mountain Region.

Common in woods, Craig Mountains, vicinity of Lake Waha, Nez Perces County, at 900 meters altitude; May 20 (No. 199).

Anemone trifolia L. Sp. Pl. i, 540 (1753).

Common in woods, Craig Mountains. vicinity of Lake Waha, Nez Perces County, at 900 meters altitude; May 20 (No. 194).

Myosurus apetalus Gay, Fl. Chil. i, 31 (1845); *Myosurus aristatus* Benth. Lond. Journ. Bot. vi, 458 [second] (1847).

Growing by roadsides at Lewiston, Nez Perces County, May 13 (No. 159).

Trautvetteria carolinensis (Walt.) Vail, Mem. Torr. Club, ii, 42 (1890); *Hydrastis carolinensis* Walt. Fl. Car. 156 (1788).

This plant does not seem to be distinct from the eastern species. Gray[1] refers to it as "forma *occidentalis*, *T. grandis* Nutt.," without description. Therefore the citation in Watson's Index, p. 27, as "var. *occidentalis* Gray" is not warranted, for Dr. Gray himself did not consider it even a variety, practically reducing Nuttall's name to a synonym.

Wet places, head of Little Potlatch River, Latah County; June 20 (No. 442). Also near Viola, Latah County, at Farmington Landing, Lake Cœur d'Alene, and in the valley of Lake Pend d'Oreille.

Ranunculus affinis R. Br. in Parry's First Voy. App. 265 (1823).

Moist places near Lake Pend d'Oreille, Kootenai County, August 5 (No. 842).

Ranunculus alismæfolius Geyer; Benth. Pl. Hartw. 295 (1839), excl. syn.

Wet places, only at head of Little Potlatch River, Latah County; June 16 (No. 418).

Ranunculus glaberrimus Hook. Fl. Bor. Amer. i, 12 (1829).

Common on moist ground, island in Clearwater River near Upper Ferry, above Lewiston; May 2 (No. 95).

[1] Proc. Amer. Acad. viii, 372 (1873).

Ranunculus lacustris terrestris (Gray) MacMillan, Met. Minn. Val. 247 (1892); Gray, Man. ed. 5, 41 (1867).

Muddy shores of Mud Lake, Kootenai County; July 25 (No. 729).

Ranunculus nelsonii (DC.) Gray, Proc. Amer. Acad. viii, 374 (1872); *R. recurvatus nelsonii* DC. Syst. i, 290 (1818).

Dr. Gray in Proc. Amer. Acad. xxi, 372 (1886), discarded the name *R. nelsonii* for this plant, and called it *R. occidentalis*. But the first publication of the latter name (Nuttall's) was in Torrey & Gray's Flora, i, 23 (1838), and it is thus antedated by the former by about twenty years.

This plant agrees fully with the Wilkes Expedition plant No. 607, in the National Herbarium, which Dr. Torrey[1] calls *R. occidentalis parviflorus*, and of which he says that it "is *R. nelsonii*, forma *typica*, Gray."

Wet ground at 1,700 meters altitude, Cedar Mountain, Latah County; June 20 (No. 461).

Ranunculus nelsonii glabriusculus; *R. nelsonii tenellus* Gray, Proc. Amer. Acad. viii, 374 (1872); *R. tenellus* Nutt.; Torr. & Gr. Fl. i, 23 (1838), not Viviani. This is probably also the same as *R. recurvatus* variety γ, Hook. Fl. Bor. Amer. i, 23 (1829).

Rich bottoms near Lapwai Agency, Nez Perces County; May 5 (No. 126). Also on Clearwater River near mouth of Big Potlatch River and in the valley of the Little Potlatch.

Ranunculus pennsylvanicus L. f. Suppl. 272 (1781).

Moist places near Rathdrum, Kootenai County; July 25 (No. 732).

Ranunculus reptans L. Sp. Pl. i, 549 (1753); *R. flammula reptans* Meyer, Lab. 96 (1830).

Sandy soil, valley of Lake Tesemini, Kootenai County; July 21 (No. 690).

Ranunculus reptans intermedius (Hook.) Torr. & Gr. Fl. i, 16 (1838); *R. flammula intermedius* Hook. Fl. Bor. Amer. i, 11 (1829).

In meadows and on mountains, head of Little Potlach River, Latah County; June 16 (No. 401).

Ranunculus septentrionalis Poir. Encycl. vi, 123 (1804).

Frequent in rich soil, Hatwai Creek, Nez Perces County; May 6 (No. 136). Wet places, valley of Little Potlatch River, Nez Perces County; June 7 (No. 332). Valley of Spokane River, near Post Falls, Kootenai County; July 18 (No. 666).

Batrachium aquatile (L.) Wimm. Fl. Schles. 8 (1841); *Ranunculus aquatilis* L. Sp. Pl. i, 566 (1753).

Near Harrison, valley of Coeur d'Alene River, Kootenai County; July 13 (No. 645).

Batrachium tricophyllum (Chaix) Bossch, Prodr. Fl. Bat. 5 (1850); *Ranunculus tricophyllus* Chaix, in Vill. Hist. Pl. Dauph. i, 335 (1786); *R. aquatilis tricophyllus* Gray, Man. ed. 5, 40 (1867).

Ponds at Lapwai Agency, Nez Perces County; May 5 (No. 131). Valley of Traille River, Kootenai County; August 9 (No. 882). Streams at Hope, on Lake Pend d'Oreille; August 20 (No. 934).

Cyrtorhyncha cymbalaria (Pursh) Britton, Mem. Torr. Club, v, 161 (1894); *Ranunculus cymbalaria* Pursh, Fl. ii, 392 (1814).

Sandy banks of Hellgate River, Bonner, Missoula County, Montana; August 31 (No. 989).

Coptis occidentalis (Nutt.) Torr. & Gr. Fl. i, 28 (1838); *Chrysocoptis occidentalis* Nutt. Journ. Acad. Phila. vii, 9 (1834).

Common in woods at 900 meters altitude, Craig Mountains, valley of Lake Waha, Nez Perces County; May 21 (No. 217).

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[1] Bot. Wilkes, 214 (1862).

Aquilegia flavescens Wats. Bot. King Surv. 10 (1871).

At 2,400 meters altitude, Packsaddle Peak, near Lake Pend d'Oreille; August 5 (No. 840).

Delphinium scopulorum Gray, Pl. Wright. ii, 9 (1853).

Copses, Spokane, Washington; August 17 (No. 921).

Delphinium scopulorum stachydeum Gray, Bot. Gaz. xii, 52 (1887).

Common at Upper Ferry, Clearwater River, above Lewiston, Nez Perces County; April 23 (No. 4).

Aconitum fischeri Reich. Ill. Acon. t. 22 (1820); *A. columbianum* Nutt.; Torr. & Gr. Fl. i, 34 (1838).

Frequent in moist, shady places, on Little Potlatch River, 15 miles south of Moscow, Latah County; June 13 (No. 378).

Actæa spicata arguta Torr. Pac. R. Rep. iv, 63 (1857).

Moist woods on the Traille River, Kootenai County; August 8 (No. 884).

Actæa spicata rubra Ait. Hort. Kew. ii, 221 (1811).

Common in canyons at 900 meters altitude, Craig Mountains, valley of Lake Waha, Nez Perces County; May 27 (No. 235).

BERBERIDACEÆ.

Berberis aquifolium Pursh, Fl. i, 219 (1814).

Common on rocks and in copses, valley of Hatwai Creek, Nez Perces County; April 28 (No. 62). Canyons, valley of Spokane River, Kootenai County; July 16 (No. 657).

Berberis nervosa Pursh, Fl. i, 219 (1814).

Woods, 4 miles east of Farmington, Latah County; June 26 (No. 507). An eastward extension of range.

NYMPHÆACEÆ.

Brasenia purpurea (Mx.) Casp. in Engler & Prantl, Nat. Pfl. iii, abt. 2, 6 (1891); *Hydropeltis purpurea* Mx. Fl. i, 324 (1803).

Ponds, Granite Station, Kootenai County; July 29 (No. 782).

Nymphæa advena Soland.; Ait. Hort. Kew. ii, 226 (1789).

Sluggish creek near Farmington Landing, Lake Cœur d'Alene; July 8 (No. 621).

Nymphæa polysepala (Engelm.) Greene, Bull. Torr. Club, xv, 84 (1888); *Nuphar polysepalum* Engelm. Trans. St. Louis Acad. ii, 283 (1865).

Ponds, valley of Lake Tesemini, Kootenai County; July 22 (No. 701).

Castalia leibergii Morong, Bot. Gaz. xiii, 124 (1888).

Ponds, Granite Station, Kootenai County; July 30 (No. 812).

FUMARIACEÆ.

Bikukulla cucullaria (L.) Millspaugh, Bull. W. Va. Agr. Exp. Sta. 2, 327 (1892); *Fumaria cucullaria* L. Sp. Pl. ii, 699 (1753); *Dicentra cucullaria* Torr. Fl. N. Y. i, 45 (1843).

Rich shady places, Upper Ferry, Clearwater River, above Lewiston; April 24 (No. 34).

Capnoides montanum (Engelm.) Britton, Mem. Torr. Club, v, 166 (1894); *Corydalis montana* Engelm.; Gray, Mem. Amer. Acad. iv, 6 (1849), as synonym; *Corydalis aurea occidentalis* Engelm.; Gray, Man. ed. 5, 62 (1867); *Capnoides aureum occidentale* Hitchcock, Spring Fl. Manhattan, 17 (1894).

Rocky hillsides, near Hatwai Creek, Nez Perces County; May 5 (No. 139). Sandy soil, south end of Lake Pend d'Oreille; July 28 (No. 765).

CRUCIFERÆ.

Roripa curvisiliqua (Hook.) Bessey, Mem. Torr. Club, v, 169 (1894); *Sisymbrium curvisiliqua* Hook. Fl. Bor. Amer. i, 61 (1829); *Nasturtium curvisiliqua* Nutt.; Torr. & Gr. Fl. i, 74 (1838).

Frequent in wet places, Julietta, Latah County; June 8 (No. 340).

Roripa nasturtium (L.) Rusby, Mem. Torr. Club, iii, 5 (1893); *Sisymbrium nasturtium* L. Sp. Pl. ii, 657 (1753); *Nasturtium officinale* R. Br. in Ait. Hort. Kew. ed. 2, iv, 110 (1812).

Frequent in wet places, Upper Ferry, Clearwater River, above Lewiston; June 2 (No. 298).

Roripa palustris (L.) Bess. Enum. 27 (1821); *Sisymbrium amphibium palustre* L. Sp. Pl. ii, 657 (1753); *Nasturtium palustre* DC. Syst. ii, 191 (1821).

Near Hope, Kootenai County; September 25 (No. 1029).

Barbarea barbarea (L.) MacMillan, Metasp. Minn. Val. 259 (1892); *Erysimum barbarea* L. Sp. Pl. ii, 660 (1753); *Barbarea vulgaris* R. Br. in Ait. Hort. Kew. ed. 2, iv, 109 (1812).

Island in Clearwater River near Upper Ferry, above Lewiston; May 2 (No. 90). Also Clearwater River near mouth of Big Potlatch, and head of Little Potlatch.

Arabis arcuata (Nutt.) Gray, Proc. Amer. Acad. vi, 187 (1864); *Streptanthus arcuatus* Nutt.; Torr. & Gr. Fl. i, 77 (1838).

Shores and sandy soil near Hatwai Creek, Nez Perces County; April 30 (No. 79). Also Upper Ferry, Clearwater River, above Lewiston; valley of Lake Waha; Clearwater River, near mouth of Big Potlatch; and head of Little Potlatch.

Arabis hirsuta (L.) Scop. Fl. Carn. ed. 2, ii, 30 (1772); *Turritis hirsuta* L. Sp. Pl. ii, 666 (1753).

Sandy soil, near Hatwai Creek, Nez Perces County; April 24 (No. 41).

Arabis perfoliata Lam. Encycl. i, 219 (1788).

Common in sandy soil, island in Clearwater River, near Upper Ferry, above Lewiston; May 2 (No. 88).

Arabis platysperma Gray, Proc. Amer. Acad. vi, 519 (1865).

Dry soil at 2,500 meters altitude, Packsaddle Peak, near Lake Pend d'Oreille; August 6 (No. 852).

Arabis retrofracta Graham, Edinb. New Phil. Journ. 7 (1829).

A good species, distinct from *A. holbœllii.*

Frequent in sandy soil, island in Clearwater River, near Upper Ferry, above Lewiston; May 2 (No. 91).

Arabis spathulata Nutt.; Torr. & Gr. Fl. 81 (1838).

Sides of Wiessner's Peak, at 1,800 meters altitude, on the St. Joseph River, Kootenai County; July 8 (No. 601).

Thelypodium laciniatum Endl. Gen. Pl. 876 (1836–40).

Rocky banks, valley of Peter Creek, Nez Perces County; May 4 (No. 122). Also along the lower Clearwater River.

Cardamine hirsuta L. Sp. Pl. ii, 655 (1753).

Frequent in wet places, valley of Peter Creek, Nez Perces County; May 4 (No. 111).

Cardamine leibergii sp. nov.

From a prostrate rootstock rooting like *Nepeta glechoma;* stem glabrous throughout, erect, 12 to 20 cm. high, leafy from the base; leaves few, alternate, simple, or on thrifty plants the lower pinnate by the development on the now elongated petiole of leaflets always much smaller than the terminal one, this slightly 5 to 9 lobed or toothed and oval in general outline, or sometimes nearly

CARDAMINE SANDBERGII HOLZINGER.

circular; petiole 1 to 2 cm. long, more or less distinct; flowers white, 3 to 4 mm. long; calyx half the length of the corolla, on pedicels equaling the flower at the time of blooming, but soon elongating, slightly diverging from the erect rachis. There was no fully matured fruit on any of the numerous plants collected.

Moist places near summit of Packsaddle Peak, Kootenai County; August 6 (No. 856).

Platyspermum scapigerum Hook. Fl. Bor. Amer. i, 268 (1830).

On hillsides near Peter Creek, Nez Perces County; May 4 (No. 110).

Draba caroliniana Walt. Fl. Car. 174 (1788).

Dry hillsides, Upper Ferry, Clearwater River, above Lewiston; May 9 (No. 141).

Draba nemorosa L. Sp. Pl. ii, 643 (1753).

Valleys, Upper Ferry, Clearwater River, above Lewiston; April 23 (No. 14). Also valley of Lake Waha, and near mouth of Big Potlatch River.

Sisymbrium incisum filipes Gray, Pl. Fendl. 8 (1849).

Common at Upper Ferry, Clearwater River, above Lewiston; April 28 (No. 59).

Sisymbrium officinale Scop. Fl. Carn. ed. 2, ii, 26 (1772); *Erysimum officinale* L. Sp. Pl. ii, 660 (1753).

Near Colgate, Montana; September 6 (No. 1035).

Erysimum asperum DC. Syst. ii, 505 (1821).

Common on hillsides, near Hatwai Creek, Nez Perces County; April 24 (No. 35). Shores, south end of Lake Cœur d'Alene; July 5 (No. 558).

Erysimum cheiranthoides L. Sp. Pl. ii, 661 (1753).

In woods, south end of Lake Pend d'Oreille; July 27 (No. 766).

Camelina sativa (L.) Crantz, Stirp. Austr. i, 18 (1762); *Myagrum sativum* L. Sp. Pl. ii, 641 (1753).

By roadsides, introduced, at Upper Ferry, Clearwater River, above Lewiston; April 28 (No. 72).

Hutchinsia procumbens (L.) Desv. Journ. Bot. iii, 168 (1814); *Lepidium procumbens* L. Sp. Pl. ii, 643 (1753); *Capsella divaricata* Nutt.; Walp. Repert. i, 175 (1842).

Moist ground at Lewiston; May 13 (No. 160).

Lepidium dictyotum Gray, Proc. Amer. Acad. vii, 329 (1868).

Common by roadsides, near Hatwai Creek, Nez Perces County; April 24 (No. 45).

Lepidium intermedium Gray, Pl. Wright. ii, 15 (1853).

Table-lands near Upper Ferry, Clearwater River, above Lewiston; April 26 (No. 60).

Lepidium montanum alyssoides (Gray) Jones, Zoe, iv, 266 (1893); *L. alyssoides* Gray, Pl. Fendl. 10 (1849).

Dry hillsides, Upper Ferry, Clearwater River, above Lewiston; May 9 (No. 145).

Thlaspi alpestre L. Sp. Pl. ed. 2, ii, 903 (1763).

Slender glabrous form. Rocks at 1,800 meters altitude, near foot of Wiessner's Peak, on the St. Joseph River, Kootenai County; July 8 (No. 595).

Thysanocarpus curvipes Hook. Fl. Bor. Amer. i, 69 (1830).

Basaltic rocks, Upper Ferry, Clearwater River, above Lewiston; April 23 (No. 8). Also, valley of Lake Waha, and valley of the Clearwater River near mouth of Big Potlatch.

Athysanus pusillus (Hook.) Greene, Bull. Cal. Acad. i, 72 (1884); *Thysanocarpus pusillus* Hook. Icon. Pl. i, t. 42 (1837).

Upper Ferry, Clearwater River, above Lewiston; April 23 (No. 5).

CAPPARIDACEÆ.

Cleome lutea Hook. Fl. Bor. Amer. i, 70 (1829).

On Hangman's Creek, near Spokane, Washington; August 15 (No. 907).

Cleome serrulata Pursh, Fl. ii, 441 (1814); *Cleome integrifolia* Torr. & Gr. Fl. i, 122 (1838).

Sandy soil south end of Lake Pend d'Oreille; July 27 (No. 742).

Jacksonia trachysperma Greene, Pittonia, ii, 195 (1891); *Polanisia trachysperma* Torr. & Gr. Fl. i, 669 (1840).

Sandy soil, Colgate, near Glendive, Dawson County, Montana; September 6 (No. 1012).

VIOLACEÆ.

Viola canadensis L. Sp. Pl. ii, 936 (1753).

Rich canyons, scarce, at 900 meters altitude, Craig Mountains, Nez Perces County; May 20 (No. 213).

Viola canina adunca (Smith) Gray, Proc. Amer. Acad. viii, 377 (1872); *Viola canina* L. Sp. Pl. ii, 935 (1753); *Viola adunca* Smith, in Rees's Cycl. xxxvii (1819).

Frequent in canyons at 900 meters altitude, Craig Mountains, Nez Perces County; May 20 (No. 207).

Viola glabella Nutt.; Torr. & Gr. Fl. i, 142 (1838).

Rich canyons, at 900 meters altitude, Craig Mountains, Nez Perces County; May 21 (No. 212). Also near Viola, Latah County, and near south end of Lake Pend d'Oreille.

Viola howellii Gray, Proc. Amer. Acad. xxii, 308 (1887).

Frequent in rich soil, mouth of Big Potlatch River, Nez Perces County; May 3 (No. 105). Canyons, Wiessner's Peak, Kootenai County; July 8 (607).

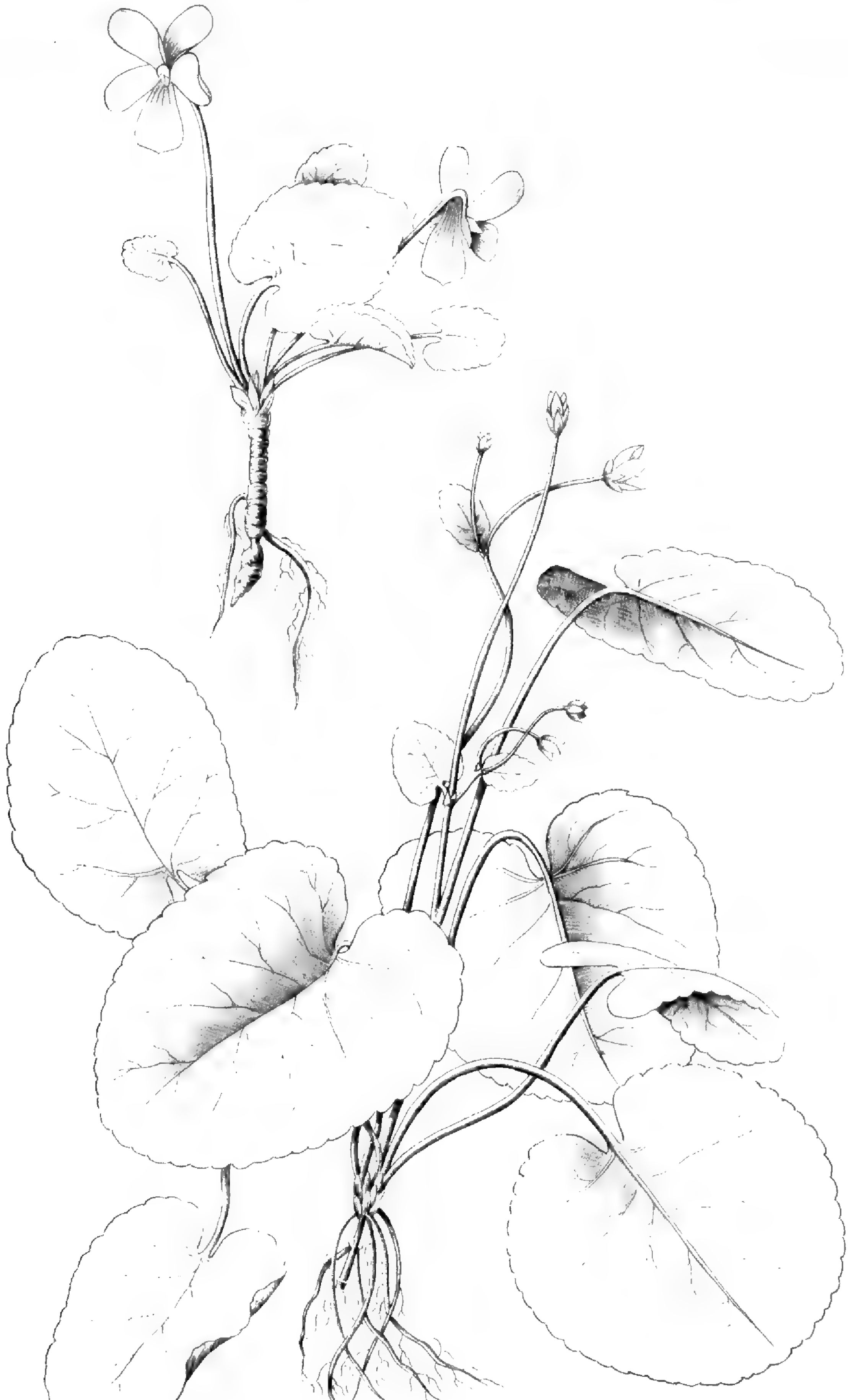
Viola nuttallii Pursh, Fl. i, 174 (1814).

Woods at 900 meters altitude, Craig Mountains, Nez Perces County; May 22 (No. 222). Found only at one point.

Viola orbiculata Geyer, Hook. Lond. Journ. Bot. vi, 73 (1847).

This has the large rootstalk, the acutely triangular glandular-margined stipules and bracts, and the stigma of *V. glabella*, but it is nearly acaulescent, the stem leaves being mostly reduced to mere stipules; the peduncles are much elongated, and the leaves are quite glabrous, the margin merely glandular-dentate, not ciliate as in *V. glabella*. The general outline of the leaf is that of *V. biflora* L.; but it is less caulescent than that species, and differs from it in rootstock, stipules, and stigma, as above noted.

The leaves are mostly radical, numerous, on slender, glabrous petioles 5 to 10 cm. long, with bright-green blade 3 to 5 cm. in diameter, generally circular in outline, but occasionally slightly elongated, the margin minutely glandular, crenate, the sinus of the deeply cordate base closed by the overlapping lobes, the under surface quite glabrous, the upper beset with scattered, short, stout, appressed hairs. The early-flowering form, with large yellow flowers on long peduncles, appears frequently as if acaulescent, nothing being left to represent the (usually two opposite) leaves of the sarmentose stem except the scarious, acutely triangular, glandular-margined stipules near the ground—the similar peduncular bract is quite near the flower. The later basal leaves are larger, on longer petioles, and in all our specimens exceed the sarmentose stems. The several weak stems bear each usually two opposite leaves much smaller than the basal leaves, on petioles 1 to 2 cm. long, the blade more ovate in outline, and the basal sinus less deep. From their axils spring 2 to 4 short-peduncled cleistogamous flowers, while the stem continues as a slender, usually leafless, stolon. This does not root in any of our specimens, though they are in fruit, and does not exceed the long-petioled later leaves; yet it probably does so later in the season.



VIOLA ORBICULATA GEYER.

In its early-flowering form this species suggests a close affinity with *V. rotundifolia* Mx. But the leafy stems remove it to the neighborhood of *V. sarmentosa* Dougl. From the latter our plant differs abundantly in the bright-green leaves with deeply cordate base, in the short, two-leafed sarmentose stems, reluctantly rooting, if at all, and in the usually clustered cleistogamous flowers.

Hooker,[1] the author, states that he is "not sure there are not two species" among his specimens of *V. sarmentosa* Dougl. One which sent out wiry stems like the runners of the strawberry and had purple-dotted leaves he took to be the probable type of Douglas's species. The other plant, he says, "has no stolons; the pale-green, almost reniform, leaves are quite destitute of dots, and have an injured flower arising from the root." This description agrees very well with the early-flowering form of our plant. For the stipules near the base of the subradical peduncle were probably present, as they are easily overlooked, unless there is at hand a good series, among which some leaf-bearing flowering stems are apt to occur. Another circumstance favoring the supposition that this is the plant referred to by Hooker is that it comes from Nez Perces County, Idaho, less than 200 miles south of the type locality of *V. sarmentosa*.

Our plant has been sent to Kew and verified by comparison with Mr. Geyer's plant.

In the London Journal of Botany, vi, 73, (1847), W. J. Hooker, in the "Catalogue of Mr. Geyer's Collection of Plants," refers to a doubtful *V. rotundifolia* Mx., stating that if it "proves distinct Mr. Geyer's mst. name of *V. orbiculata* should be adopted."

The plant has been known since 1833, as is seen from the following list of the specimens in the National Herbarium:

1. Douglas's plant, from the Columbia River, Washington, collected 1833.

2. The Wilkes Expedition plant, No. 338, from the Cascade Mountains, collected 1838 to 1842.

3. Geyer's plant, No. 295, from the Cœur d'Alene Mountains, Idaho, collected in 1843–4.

4. Rothrock's plant, No. 21, from Northern British Columbia, collected in 1865–6.

5. Sandberg's, No. 214, collected in Nez Perces County, Idaho, in 1892.

The synonymy is as follows:

V. sarmentosa Dougl. in part; Hook. Fl. Bor. Amer. i, 81 (1830); *V. rotundifolia* (?) Hook. Lond. Journ. Bot. vi, 73 (1847); Torr. Bot. Wilkes, 237 (1874), not Dougl.

Frequent in rich canyons, at 900 meters altitude, Craig Mountains, Nez Perces County; May 2 (No. 214).

Viola obliqua Hill, Hort. Kew. 316 (1769); *V. cucullata* Ait. Hort. Kew. iii, 288 (1789); *V. palmata cucullata* Gray, Bot. Gaz. xi, 254 (1886).

Moist soil, valley of Peter Creek, Nez Perces County; May 4 (113). Also vicinity of Lake Waha.

Viola palustris L. Sp. ii, 934 (1753).

Marshes near Granite Station, Kootenai County; July 29 (No. 793).

CARYOPHYLLACEÆ.

Silene antirrhina L. Sp. Pl. i, 419 (1753).

Common in shady places at Upper Ferry, Clearwater River, above Lewiston; May 17 (No. 190).

Silene menziesii Hook. Fl. Bor. Amer. i, 90 (1829).

Rich, shady places, Upper Ferry, Clearwater River, above Lewiston; May 17 (No. 186).

[1] Fl. Bor. Amer. i, 80, 81 (1830).

Silene multicaulis Nutt.; Torr. & Gr. Fl. i, 192 (1842).

Common on dry hillsides, Julietta, Latah County; June 8 (No. 342).

Silene scouleri Hook. Fl. Bor. Amer. i, 88 (1830).

Sandy soil near Rathdrum; July 18 (No. 669).

Cerastium arvense L. Sp. Pl. i, 438 (1753).

Sandy soil at Upper Ferry, Clearwater River, above Lewiston; April 26 (No. 49).

Cerastium longipedunculatum Muhl. Cat. 46 (1813); *C. nutans* Raf. Prec. Dec. 36 (1814).

Island in Clearwater River, near Upper Ferry, above Lewiston; May 2 (No. 98). Woods, valley of Pine Creek, near Farmington, Latah County; June 28 (No. 514).

Alsine borealis (Bigel.) Britton, Mem. Torr. Club, v, 149 (1894); *Stellaria borealis* Bigel. Fl. Bost. ed. 2, 182 (1824).

Frequent in moist places, near Julietta, Latah County; June 8 (No. 349).

Alsine crispa (Cham. & Schlecht.); *Stellaria crispa* Cham. & Schlecht. Linn. i, 51 (1826).

Springy places, valley of Pine Creek, near Farmington, Latah County; June 29 (No. 527).

Alsine jamesii (Torr.); *Stellaria jamesii* Torr. Ann. Lyc. N. Y. ii, 169 (1828).

Common along creeks, near Hatwai Creek, Nez Perces County; April 30 (No. 78). Wooded ravine, on the St. Joseph River at 1,800 meters altitude, Wiessner's Peak, Kootenai County; July 8 (No. 608).

Alsine longifolia (Muhl.) Britton, Mem. Torr. Club, v, 150 (1894); *Stellaria longifolia* Muhl.; Willd. Enum. 479 (1809).

Frequent in meadows, head of Little Potlatch River, Latah County; June 16 (No. 410). Wet places near Mud Lake, Kootenai County; July 25 (No. 740).

Alsine longipes (Goldie) Coville, Contr. Nat. Herb. iv, 70 (1893); *Stellaria longipes* Goldie, Edinb. Phil. Journ. vi, 327 (1822).

Valley of the Big Potlatch River, 4 miles from its mouth, Nez Perces County; June 8 (No. 361). Frequent in wet places near Viola, Latah County; June 23 (No. 487).

Alsine media L. Sp. Pl. i, 272 (1753); *Stellaria media* Cyr. Char. Comm. 36 (1784).

Common along creeks, near Upper Ferry, Clearwater River, above Lewiston; May 10 (No. 154).

Alsine nitens (Nutt.); Greene, Bot. Bay Reg. 33 (1894); *Stellaria nitens* Nutt.; Torr. & Gray, Fl. i, 185 (1838).

On hillsides, throughout valley of Clearwater River, Nez Perces County; April 23 (No. 15). Also valley of Lake Waha and mouth of Big Potlatch River.

Alsine uliginosa (Murr.) Britton, Mem. Torr. Club, v, 150 (1893); *Stellaria uliginosa* Murr. Prodr. Goett. 55 (1770).

Moist places, Packsaddle Peak, Kootenai County; Aug. 6 (No. 865).

Arenaria capillaris Poir. Lam. Encycl. vi, 380 (1804).

Summit of Wiessner's Peak on the St. Joseph River, at 1,800 meters altitude, Kootenai County; July 8 (No. 589).

Arenaria congesta Nutt.; Torr. & Gr. Fl. i, 178 (1838).

Frequent on dry hillsides, head of little Potlatch River; Latah County, June 2 (No. 478).

Arenaria lateriflora L. Sp. Pl. i, 423 (1753).

Frequent on dry soil, head of little Potlatch River, Latah County; June 16 (No. 399).

Arenaria macrophylla Hook. Fl. Bor. Amer. i, 102 (1830).

Sandy soil, Craig Mountains, at 900 meters altitude, Nez Perces County; May 17 (No. 201). Also Clearwater River, near mouth of Big Potlatch, head of Little Potlatch, and near Farmington, Latah County.

Tissa rubra (L.) Britton, Bull. Torr. Club, xvi, 127 (1889); *Arenaria rubra* L. Sp. Pl. i, 423 (1753).

Roadsides, head of Little Potlatch River, Latah County; June 16 (No. 408). Farmington Landing, Lake Cœur d'Alene; July 4 (No. 548). Also near Viola and Farmington, Latah County.

PORTULACACEÆ.

Portulaca oleracea L. Sp. Pl. i, 445 (1753).

Spokane Bridge, 18 miles east of Spokane, Washington; August 15 (No. 897).

Claytonia arenicola Henderson, Bull. Torr. Club, xxii, 49 (1895).

Common in shady, moist places on Hatwai Creek, Nez Perces County; April 24 (No. 36).

Claytonia chamissoi Ledeb.; Spreng. Syst. Veg. i, 790 (1825).

Wet places, head of Little Potlatch River, Latah County; June 16 (No. 398). Also near Viola, Latah County.

Claytonia caroliniana sessilifolia Torr. Pac. R. Rep. iv, 70 (1856).

Rich, moist soil, Craig Mountains, at 900 meters altitude, Nez Perces County; May 20 (No. 1040).

Claytonia parvifolia Moçino; DC. Prodr. iii, 361 (1828).

Moist crevices at 2,600 meters altitude, Packsaddle Peak, near Lake Pend d'Oreille; August 5 (No. 849). There were only two small plants of this species in the collection.

Claytonia perfoliata Donn; Willd. Sp. Pl. i, 1186 (1798).

Common in shady, moist places, valley of Hatwai Creek, Nez Perces County; April 24 (No. 37).

Claytonia sibirica L. Sp. Pl. i, 204 (1753).

Rich, moist soil, Craig Mountains, at 900 meters altitude, Nez Perces County, May 20 (No. 208). Same locality; May 25 (No. 246). Also near Upper Ferry, Clearwater River, above Lewiston; valley and head of Little Potlatch River, Latah County, and near Viola, Latah County.

HYPERICACEÆ.

Hypericum formosum scouleri (Hook.) Coult. Bot. Gaz. xi, 108 (1886); *Hypericum scouleri* Hook. Fl. Bor. Amer. i, 111 (1830).

Copses 4 miles east of Farmington, Latah County, Idaho; June 28 (No. 512). Meadows, Granite Station, Kootenai County; July 29 (No. 792).

MALVACEÆ.

Sidalcea malvæflora (DC.) Gray, Pl. Wright. i, 16 (1852); *Sida malvæflora* DC. Prodr. i, 474 (1824).

Meadows 15 miles south of Moscow, Latah County; June 14 (No. 391). Also valley and head of Little Potlatch River, and North Fork of Hangman's Creek, east of Farmington, Latah County.

Sphæralcea acerifolia Nutt.; Torr. & Gray, Fl. i, 228 (1838).

In canyons near Farmington Landing, Lake Cœur d'Alene, Kootenai County; July 5 (No. 562).

Sphæralcea munroana (Dougl.) Spach, Proc. Amer. Acad. xxii, 292 (1887); *Malva munroana* Dougl.; Lindl. Bot. Reg. t. 1306 (1830).

Rocky hillsides, valley of Big Potlatch River, 4 miles from its mouth; June 4 (No. 302).

LINACEÆ.

Linum digynum Gray, Proc. Amer. Acad. vii, 334 (1868).

Sandy soil, valley of Big Potlatch River, 4 miles from its mouth; June 4 (No. 311). Moist places near Spokane, Washington; August 18 (No. 929).

Linum lewisii Pursh, Fl. i, 210 (1814).

Dry ridges near Farmington Landing, Lake Cœur d'Alene, July 2 (No. 533).

GERANIACEÆ.

Geranium carolinianum longipes Wats. Bot. King Surv. 50 (1871).

Common on sandy soil, Upper Ferry, Clearwater River, above Lewiston; May 31 (No. 279).

Geranium incisum Nutt.; Torr. & Gr. Fl. i, 20 (1838).

Upper Ferry, Clearwater River, above Lewiston; May 5 (No. 140).

Erodium cicutarium (L.) L'Her.; Ait. Hort. Kew. 2, 414 (1811); *Geranium cicutarium* L. Sp. Pl. ii, 680 (1753).

Hills and valleys, common, Upper Ferry, Clearwater River, above Lewiston; April 28 (No. 58). Widely distributed in Nez Perces and Latah counties.

Impatiens aurea Muhl. Cat. 26 (1813); *I. pallida* Nutt. Gen. i, 46 (1818).

Moist places, valley of Mud Lake, Kootenai County; July 25 (No. 738).

CELASTRACEÆ.

Pachystima myrsinites (Pursh) Raf. Amer. Monthly Mag. 176 (Jan., 1818); *Ilex myrsinites* Pursh, Fl. i, 119 (1814).

Frequent in woods at 1,050 meters altitude, Cedar Mountain, Latah County; June 17 (No. 428).

RHAMNACEÆ.

Rhamnus alnifolia L'Her. Sert. Angl. 5 (1788).

Shores at Farmington Landing, Lake Cœur d'Alene; June 6 (No. 566). A low, straggling bush.

Rhamnus californica Esch. Mem. Acad. Petr. x, 285 (1826).

Copses, valley of Big Potlatch River, 4 miles from its mouth, Nez Perces County; June 8 (No. 352). This plant approaches *R. purshiana.*

Rhamnus purshiana DC. Prodr. ii, 25 (1825).

Frequent along streams, vicinity of Hatwai Creek, Nez Perces County; May 9 (No. 156). Deep canyons near Farmington Landing, Lake Cœur d'Alene; July 7 (No. 576).

Ceanothus sanguineus Pursh, Fl. i, 167 (1814).

Common in copses, head of Little Potlatch River, Latah County; June 16 (No. 414).

Ceanothus velutinus Dougl.; Hook. Fl. Bor. Amer. i, 125 (1830).

Frequent in canyons at 1,100 meters altitude, Bald Knob, Cedar Mountain, Latah County; June 20 (No. 473).

Ceanothus velutinus lævigatus Torr. & Gr. Fl. i, 265 (1838).

Camyak Butte, Washington; June 26 (No. 501).

ACERACEÆ.

Acer glabrum Torr. Ann. Lyc. N. Y. 2, 172 (1826).

Common in moist copses, on Hatwai Creek, Nez Perces County; April 30 (No. 81). Bottom lands, same locality; May 17 (No. 182). Copses at Upper Ferry, Clearwater River, above Lewiston; May 30 (No. 277).

ANACARDIACEÆ.

Rhus glabra L. Sp. Pl. i, 265 (1753).

At Spokane Bridge, 18 miles east of Spokane, Washington; August 10 (No. 895).

Rhus radicans L. Sp. Pl. i, 266 (1753); *Rhus toxicodendron* L. loc. cit.

Copses at Hope, east side of Lake Pend d'Oreille; August 25 (No. 963).

Rhus trilobata Nutt.; Torr. & Gr. Fl. i, 219 (1838).

On plains, near Glendive, Dawson County, Montana; September 6 (No. 1008).

LEGUMINOSÆ.

Thermopsis montana Nutt.; Torr. & Gr. Fl. i, 388 (1838).

Sandy shores, valley of Hatwai Creek, Nez Perces County; April 28 (No. 68). Also at Upper Ferry, Clearwater River, above Lewiston; valley of Lake Waha; Clearwater River above mouth of Big Potlatch; and head of Little Potlatch River.

Lupinus burkei Wats. Proc. Amer. Acad. viii, 525 (1873).

Grassy hillsides, island in Clearwater River, near Upper Ferry, above Lewiston; May 2 (No. 99). Also in the valley of Lake Waha.

Lupinus flexuosus Lindl.; Agardh, Syn. 34 (1835).

Common at Upper Ferry, Clearwater River, above Lewiston; April 24 (No. 1041).

Lupinus laxiflorus Dougl.; Lindl. Bot. Reg. xiv, t. 1140 (1828).

Craig Mountains at 900 meters altitude; May 22 (No. 226).

Lupinus lepidus Dougl.; Lindl. Bot. Reg. xiv, t. 1149 (1828). Albino form.

On Peter Creek near Upper Ferry, Clearwater River, above Lewiston; May 4 (No. 120). Very common in that vicinity; not found elsewhere.

Lupinus leucophyllus Dougl.; Lindl. Bot. Reg. xiii, t. 1124 (1828).

Upper Ferry, Clearwater River, above Lewiston; May 17 (No. 189). Also valley of Lake Waha, valley of Little Potlatch River, and near Viola, Latah County.

Lupinus ornatus Dougl.; Lindl. Bot. Reg. xv, t. 1216 (1829).

Common at Upper Ferry, Clearwater River, above Lewiston; April 24 (No. 23).

Lupinus polyphyllus Lindl. Bot. Reg. xiii, t. 1096 (1827).

Canyons at Farmington Landing, Lake Cœur d'Alene; July 7 (No. 577).

Medicago sativa L. Sp. Pl. ii, 778 (1753).

Railroad tracks, Spokane, Washington; August 18 (No. 927).

Trifolium altissimum Dougl.; Hook. Fl. Bor. Amer. i, 130 (1830).

Bottom lands on Little Potlatch River; June 7 (No. 334). Also head of Little Potlatch River; near Viola, Latah County; and 4 miles east of Farmington, Latah County.

Trifolium cyathiferum Lindl. Bot. Reg. xiii, sub. t. 1070 (1827).

Sparingly in moist places, Julietta, Latah County; June 8 (No. 346).

Trifolium involucratum Willd. Sp. Pl. iii, 1372 (1800).

Near Spokane, Washington; August 17 (No. 1028).

Trifolium longipes latifolium Hook. Lond. Journ. Bot. vi, 209 (1847).

Frequent on grassy slopes, Craig Mountains at 900 meters altitude, Nez Perces County; May 20 (No. 216).

Trifolium microcephalum Pursh, Fl. ii, 478 (1814).

Sandy soil on Big Potlatch River, 4 miles from its mouth; June 2 (No. 310). Also on Clearwater River above mouth of Big Potlatch; valley of Little Potlatch; and near Viola, Latah County.

Trifolium pauciflorum Nutt.; Torr. & Gr. Fl. i, 319 (1838).

Moist places near Spokane, Washington; August 18 (No. 923).

Lotus americanus (Nutt.) Bisch. Litt. Ber. Linnæa, xiv, 132 (1840); *Trigonella americana* Nutt. Gen. ii, 120 (1818); *Lotus sericeus* Pursh, Fl. i, 489 (1814), not DC. (1813); *Hosackia purshiana* Benth. Bot. Reg. xv, t. 1257 (1829).

Sandy soil, shore of Lake Cœur d'Alene, near Farmington Landing; July 11. (No. 615).

Lotus douglasii Greene, Pittonia, ii, 149 (1892); *Hosackia decumbens* Benth. Bot. Reg. xv, sub t. 1257 (1829).

Sandy shores, near Farmington Landing, Lake Cœur d'Alene; July 4 (No. 551).

Lotus pinnatus Hook. Bot. Mag. t. 2913 (1829); *Hosackia bicolor* Dougl.; Lindl. Bot. Reg. xv, t. 1257 (1829).

Meadows, head of Little Potlatch River, Latah County; June 16 (No. 402). Also near Viola, Latah County.

Psoralea lanceolata Pursh, Fl. ii, 475 (1814).

Upper Ferry, Clearwater River, above Lewiston; June 2 (No. 301).

Astragalus[1] **arrectus** Gray, Proc. Amer. Acad. viii, 289 (1870)

Northern slopes on Hatwai Creek, Nez Perces County; May 5 (No. 135). Also valley of Lake Waha.

Astragalus gibbsii Kellogg, Proc. Cal. Acad. ii, 161 (1863).

Dry hillsides, near Upper Ferry, Clearwater River, above Lewiston; May 5 (No. 142). Also valley of Lake Waha.

Astragalus inflexus Dougl.; Hook. Fl. Bor. Amer. i, 151 (1830).

Hillsides, Upper Ferry, Clearwater River, above Lewiston; April 23 (No. 9). Also valley of Lake Waha.

Astragalus microcystis Gray, Proc. Amer. Acad. vi, 220 (1864).

Sandy shores at south end of Lake Pend d'Oreille; August 1 (No. 816).

Astragalus mortoni Nutt. Journ. Acad. Phila. vii, 19 (1834).

Frequent at 1,170 meters altitude, Bald Knob, Cedar Mountain, Latah County; June 20 (No. 473).

Astragalus spaldingii Gray, Proc. Amer Acad. vi, 524 (1865).

Frequent on dry hillsides, head of Little Potlatch River, Latah County; June 18 (No. 1037).

Glycyrrhiza lepidota Pursh, Fl. 480 (1814).

Shore of Lake Cœur d'Alene, south end; August 4 (No. 826).

Hedysarum flavescens Coult. & Fish. Bot. Gaz. xviii, 300 (1893).

This species is distinguished from *H. boreale* by larger leaflets, only 9 to 15, and especially by the cream-colored flowers on slender pedicles. The joints of the lomenta are little larger than in *H. boreale*, usually only two maturing, the lowest aborted one serving as a stipe.

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[1] The Astragali were determined by Mr. E. P. Sheldon, University of Minnesota, Minneapolis, Minn.

Besides Sandberg's 748 (Idaho Exp., 1892), there are in the National Herbarium Rev. F. D. Kelsey's plant from Helena, Montana (July, 1888), in fruit; and Frank Tweedy's plant from Yellowstone Park (July, 1885), in flower.

South end of Lake Pend d'Oreille; July 27 (No. 748).

Onobrychis sativa Lam. Fl. Fr. ii, 652 (1815).

Meadows, near Viola, Latah County; June 26 (No. 494).

Vicia americana Muhl.; Willd. Sp. Pl. iii, 1096 (1801).

Common in copses, valley of Hatwai Creek, Nez Perces County; April 28 (No. 65).

Frequent at head of Little Potlatch River, Latah County; June 16 (No. 413).

Vicia americana truncata Nutt.; Brewer, Bot. Cal. i, 158 (1876).

Copses, valley of Big Potlatch River, Nez Perces County; June 4 (No. 314).

Woods, valley of Spokane River, Kootenai County; July 17 (No. 667).

Lathyrus nevadensis Wats. Proc. Amer. Acad. xi, 133 (1876).

Woods, at 2,700 meters altitude, Wiessner's Peak, Kootenai County; July 8 (No. 611).

Lathyrus palustris L. Sp. Pl. ii, 733 (1753).

Sandy hillsides, on Little Potlatch River, Nez Perces County; June 13 (No. 383).

Lathyrus bijugatus White, Bull. Torr. Club, xxi, 457 (1894).

Rocky ground at 900 meters altitude on Big Potlatch River, Nez Perces County; June 9 (No. 362). Not found elsewhere.

Lathyrus bijugatus sandbergii White, Bull. Torr. Club, xxi, 457 (1894).

Frequent on hillsides, head of little Potlatch River, Latah County; June 16 (No. 412).

Lathyrus venosus californicus Wats. Proc. Amer. Acad. xi, 133 (1876).

On slopes, near Upper Ferry, Clearwater River, above Lewiston; April 28, (No. 74).

ROSACEÆ.

Prunus demissa (Nutt.) Walp. Rep. ii, 10 (1843); *Cerasus demissa* Nutt.; Torr. & Gr. Fl. i, 411 (1840).

Common in copses, island in Clearwater River, near Upper Ferry, above Lewiston; May 2 (No. 97). Copses at Thompson Falls, Montana; August 27 (No. 977).

Prunus emarginata mollis Brewer, Bot. Cal. i, 167 (1876).

Common in copses on Hatwai Creek, Nez Perces County; May 5 (No. 137).

Prunus subcordata Benth. Pl. Hartw. 308 (1848).

Rich woods, at 900 meters altitude, Craig Mountains, Nez Perces County; May 17 (No. 203).

Opulaster capitatus (Pursh) Kuntze, Rev. Gen. Pl. ii, 949 (1891); *Spiræa capitata* Pursh, Fl. i, 342 (1814).

Deep canyons, near Farmington Landing, Lake Cœur d'Alene; July 7 (No. 575).

Opulaster monogynus (Torr.) Kuntze, Rev. Gen. Pl. ii, 949 (1891); *Spiræa monogyna* Torr. Ann. Lyc. N. Y. ii, 194 (1828).

Frequent in copses, Upper Ferry, Clearwater River, above Lewiston; May 30 (No. 1042).

Opulaster opulifolius (L.) Kuntze, Rev. Gen. Pl. ii, 949 (1891); *Spiræa opulifolia* L. Sp. Pl. i, 489 (1753).

Frequent in copses, Upper Ferry, Clearwater River; May 30 (No. 274).

Spiræa ariæfolia Smith, in Rees's Cycl. xxxiii (1819).

Shore of Lake Cœur d'Alene, near Farmington Landing; July 7 (No. 583).

Spiræa betulifolia Pallas, Fl. Ross. i, 33, t. 16 (1784).

No. 539 is not typical. It has the corymb somewhat elongated, as in *S. salicifolia*, and may be a hybrid.

Common on dry hillsides, near Upper Ferry, Clearwater River, above Lewiston; June 2 (No. 299). In canyons and on shores, near Farmington Landing, Lake Cœur d'Alene; July 4 (No. 539).

Spiræa douglasii menziesii (Hook.) Presl, Epimel. Bot. 195 (1849); *Spiræa menziesii* Hook. Fl. Bor. Amer. 173 (1834).

Along streams near Farmington Landing, Lake Cœur d'Alene; July 2 (No. 537); July 4 (No. 538).

Rubus arcticus L. Sp. Pl. i, 494 (1753).

Marshes and rivers, Granite Station, Kootenai County; July 29 (No. 794).

Rubus nutkanus Moçino, Lindl. Bot. Reg. t. 1368 (1830).

Common in copses, near Upper Ferry, Clearwater River, above Lewiston; June 2 (No. 300).

Rubus pedatus Smith, Icon. Ined. t. 63 (1789–1791).

Moist places, valley of Traille River, Kootenai County; August 10 (No. 888).

Rubus strigosus Mx. Fl. i, 297 (1803).

Common on rich bottoms, valley of Hatwai Creek, Nez Perces County; May 27 (No. 259). Among rocks, near the summit of Packsaddle Peak, Kootenai County; August 6 (No. 859).

Rubus ursinus Cham. & Schlecht. Linnæa, ii, 11 (1827).

Burnt tract, near Farmington Landing, Lake Cœur d'Alene; July 6 (No. 570).

Geum ciliatum Pursh, Fl. i, 352 (1814).

According to MacMillan[1] this is the older name for *Geum triflorum* Pursh.[2]

Common on hillsides, Clearwater River, at mouth of Big Potlatch, Nez Perces County; May 2 No. 107).

Geum japonicum Thunb. Fl. Jap. 220 (1784).

Rich soil, Lapwai Agency, Nez Perces County; May 5 (No. 127). Also Upper Ferry, Clearwater River, above Lewiston; valley of Lake Waha, and of Little Potlatch River; vicinity of Farmington, Latah County; and south end of Lake Pend d'Oreille.

Geum strictum Ait. Hort. Kew. ii, 217 (1789).

Frequent in shady places near Julietta, Latah County; June 8 (No. 345).

Fragaria sp.

With the aspect in leaves and pubescence of *F. vesca*. But the flowering stems are weak, 1 to 2 dm. long; the large, light rose-colored flowers, 1.5 to 2 cm. in diameter, are borne nodding on curved pedicels, and there are scattered hairs among the superficial akenes. Ripe fruit was not collected, hence it is not certain that it is fleshy and juicy.

Woods, valley of Pine Creek, near Farmington Landing, Latah County; June 28 (No. 508).

Fragaria virginiana illinoensis Gray, Man. ed. 5, 155 (1867).

This plant has two extra bracts on the petiole.

Common on rich hillsides, Clearwater River at mouth of Big Potlatch, Nez Perces County; May 2 (No. 106). Craig Mountains at 900 meters altitude, near Lake Waha, Nez Perces County; May 21 (No. 219); May 22 (No. 223).

Potentilla anserina L. Sp. Pl. i, 495 (1753).

Shore of Lake Pend d'Oreille, near Hope; August 20 (No. 937).

Potentilla glandulosa Lindl. Bot. Reg. xix, t. 1583 (1833).

Sandy soil, Upper Ferry, Clearwater River, above Lewiston; April 26 (No. 47). Rocky hillsides on Hatwai Creek, Nez Perces County; May 14 (No. 175). Dry copses, frequent, valley of Big Potlatch River, Nez Perces County; June 6 (No. 316).

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[1] Metasp. Minn. Valley, 299 (1892).

[2] Fl. ii, 736 (1814).

Potentilla gracilis Dougl.; Hook. Bot. Mag. t. 2984 (1830).

Sandy soil, island in Clearwater River, near Upper Ferry, above Lewiston; May 10 (No. 153). Common in rocky soil on Hatwai Creek, Nez Perces County; May 27 (No. 257). Also valley of Lake Waha.

Potentilla millegrana Engelm.; Lehm. Add. Ind. Sem. Hamb. 12 (1849); *P. rivalis millegrana* Wats. Proc. Amer. Acad. viii, 553 (1873).

Potentilla palustris (L.) Scop. Fl. Carn. ed. 2, i, 359 (1772); *Comarum palustre* L. Sp. Pl. i, 502 (1753).

Wet marshes, valley of Lake Tesemini, Kootenai County; July 21 (No. 688).

Rich bottoms at Lewiston, Nez Perces County; May 13 (No. 158). Also on Clearwater River, near mouth of Big Potlatch, and at head of Little Potlatch River.

Sibbaldia procumbens L. Sp. Pl. i, 284 (1753).

On rocks, summit of Packsaddle Peak, Kootenai County; August 5 (No. 836).

Sanguisorba annua nom. nov.; *Poterium annuum* Nutt.; Hook. Fl. Bor. Amer. i, 198 (1834).

Frequent on sandy soil, valley of Big Potlatch River, Nez Perces County; June 4 (No. 309).

Rosa blanda Ait. Hort. Kew. ii, 202 (1789).

High ridges, valley of Little Potlatch River, Latah County; June 13 (No. 381). In canyons at Farmington Landing, Lake Cœur d'Alene; July 7 (No. 581). Also at head of Little Potlatch River.

Rosa californica Cham. & Schlecht. Linnæa, ii, 35 (1827).

Common in copses on Hatwai Creek, Nez Perces County; May 14 (No. 173). Shores of Lake Pend d'Oreille, east side, near Lake View; August 7 (No. 871).

Rosa fendleri Crepin, Prim. Monogr. Ros. 452 (1874).

Copses at Thompson Falls, Montana; August 27 (No. 973). Plains, Colgate, near Glendive, Dawson County, Montana; September 6 (No. 1009).

Rosa gymnocarpa Nutt.; Torr. & Gr. Fl. i, 461 (1840).

Canyons, valley of Little Potlatch River, Latah County; June 13 (No. 385). Woods on Wiessner's Peak, Kootenai County; July 11 (No. 619). Also head of Little Potlatch River, North Fork of Hangman's Creek, Kootenai County, valley of Spokane River, Kootenai County, and south end of Lake Pend d'Oreille.

Rosa pisocarpa Gray, Proc. Amer. Acad. viii, 382 (1872).

Copses at Thompson Falls, Montana; August 27 (No. 974).

Rosa sp.

Distinguished at once from all other North American roses by the densely spiny fruits, and the stem with few epidermal spines, or frequently with none. Infrastipular thorns none; flowers solitary at the ends of short, leafy branches. Leaves and size of flowers nearly as in *R. lucida*.

Canyons near Farmington Landing, south end of Lake Cœur d'Alene; July 7 (No. 572).

Sorbus sambucifolia (Cham. & Schlecht.) Rœm. Syn. Monogr. iii, 39 (1847); *Pyrus* (*Sorbus*) *sambucifolia* Cham. & Schlecht. Linnæa, ii, 36 (1827).

Frequent in woods at 1,000 meters altitude, Cedar Mountain, Latah County; June 17 (No. 421).

Cratægus rivularis Nutt.; Torr. & Gr. Fl. i, 464 (1840).

Common along streams, valley of Hatwai Creek, Nez Perces County; April 25 (No. 43). Copses, scarce, on Little Potlatch River, Latah County; June 13 (No. 377).

Cratægus tomentosa L. Sp. Pl. i, 476 (1753).

Copses, frequent, Craig Mountains at 900 meters altitude, Nez Perces County; May 25 (No. 249). Hope, Kootenai County; August 26 (No. 1032).

Amelanchier alnifolia Nutt.; Torr. & Gr. Fl. i, 473 (1840), as synonym; *Aronia alnifolia* Nutt. Gen. i, 306 (1818).

Banks of Hatwai Creek, Nez Perces County; April 24 (No. 26). Copses near Upper Ferry, Clearwater River, above Lewiston; April 26 (No. 53). Also vicinity of Lake Waha, and Clearwater River near mouth of Big Potlatch.

SAXIFRAGACEÆ.

Saxifraga bronchialis L. Sp. Pl. i, 400 (1753).

South end of Lake Pend d'Oreille; July 27 (No. 755).

Saxifraga heterantha Hook. Fl. Bor. Amer. i, 252 (1834).

Moist crevices of rocks, Upper Ferry, Clearwater River, above Lewiston; May 2 (No. 92). Also on Packsaddle Peak, Kootenai County, in August.

Saxifraga integrifolia Hook. Fl. Bor. Amer. i, 249 (1834).

Grassy slopes, Upper Ferry, Clearwater River, above Lewiston; April 30 (No. 73).

Meadows, head of Little Potlatch River, Latah County; June 18 (No. 432).

Saxifraga leucanthemifolia Mx. Fl. i, 268 (1803).

Crevices of rocks, near summit of Packsaddle Peak, Kootenai County; August 5 (No. 834).

Saxifraga reflexa Hook. Fl. Bor. Amer. i, 249 (1834).

Moist hillsides, island in Clearwater River, near Upper Ferry, above Lewiston; May 2 (No. 93). Also near south end of Lake Pend d'Oreille.

Tiarella unifoliata Hook. Fl. Bor. Amer. i, 238, t. 81 (1834).

Common in woods at 1,170 meters altitude, Bald Knob, Cedar Mountain, Latah County; June 20 (No. 454).

Tellima parviflora (Nutt.) Hook. Fl. Bor. Amer. i, 239 (1834); *Lithophragma parriflora* Nutt. Journ. Acad. Phila. vii, 26 (1834).

Common in rocky places, Upper Ferry, Clearwater River, above Lewiston; April 24 (No. 19).

Mitella breweri Gray, Proc. Amer. Acad. vi, 533 (1865).

Wet places, near summit of Packsaddle Peak, Kootenai County; August 6 (No. 843).

Mitella caulescens Nutt.; Torr. & Gr. Fl. i, 586 (1840).

Near Farmington Landing, Lake Cœur d'Alene; July 5 (No. 553).

Mitella pentandra Hook. Bot. Mag. lvi, t. 2933 (1829); Fl. Bor. Amer. i, 241 (1834).

Moist, grassy places, near summit of Packsaddle Peak, Kootenai County; August 5 (No. 837).

Mitella trifida Graham, Edinb. N. Phil. Journ. April–June, 1829, 185 (1829).

Frequent in canyons, Craig Mountains at 900 meters altitude, Nez Perces County; May 23 (No. 232). Common in moist places on Little Potlatch River, Nez Perces County; June 13 (No. 380).

Heuchera cylindrica Dougl.; Hook. Fl. Bor. Amer. i, 236 (1834).

Petals usually none, occasionally present, then very small.

Common on rocky soil, valley of Clearwater River near Lewiston; May 13 (No. 161).

Parnassia fimbriata Banks, in Kœnig & Sims, Ann. Bot. i, 391 (1805).

South end of Lake Pend d'Oreille; July 27 (No. 760).

Philadelphus lewisii Pursh, Fl. i, 329 (1814).

Common on hillsides and in copses on Hatwai Creek, Nez Perces County; May 27 (No. 253).

Ribes aureum Pursh, Fl. i, 164 (1814).

Banks, Upper Ferry, Clearwater River, above Lewiston, Nez Perces County; April 28 (No. 57). Also valley of Lake Waha, and on Clearwater River near mouth of Big Potlatch.

Ribes cereum Dougl. Trans. Hort. Soc. vii, 512 (1830).

On rocks, Spokane, Washington; April 20 (No. 130).

Ribes lacustre Poir. Encycl. Suppl. ii, 856 (1811).

Frequent in canyons at 900 meters altitude, Craig Mountains, Nez Perces County; May 27 (No. 231). Canyons near Rathdrum, Kootenai County; July 23 (No. 710).

Ribes niveum Lindl. Bot. Reg. xx, t. 1692 (1834).

The excellent series of specimens sent in by Dr. Sandberg leaves no doubt as to the specific rank of this plant. Its name, therefore, can not belong to the synonomy of *R. gracile* Mx., as in Watson's Index.

Along Hatwai Creek, Nez Perces County; April 24 (No. 31). In wet places at 900 meters altitude, Craig Mountains, Nez Perces County; May 24 (No. 243).

Ribes oxyacanthoides L. Sp. Pl. i, 201 (1753).

Shady places, Craig Mountains at 900 meters altitude, Nez Perces County; May 20 (No. 210). Canyons, scarce, valley of Little Potlatch River, Latah County; June 13 (No. 386). Also near Upper Ferry, Clearwater River, above Lewiston.

Ribes viscosissimum Pursh, Fl. i, 163 (1814).

Frequent in woods at 900 meters altitude, Craig Mountains, Nez Perces County; May 21 (No. 218).

CRASSULACEÆ.

Sedum roseum (L.) Scop. Fl. Carn. ed. 2, i, 326 (1772); *Rhodiola rosea* L. Sp. Pl. ii, 1035 (1753).

Crevices of rocks at 2,600 meters, Packsaddle Peak, Kootenai County; August 6 (No. 860).

Sedum spathulifolium Hook. Fl. Bor. Amer. i, 227 (1834).

Common on rocky slopes, Upper Ferry, Clearwater River, above Lewiston, Nez Perces County; May 17 (No. 191).

DROSERACEÆ.

Drosera rotundifolia L. Sp. Pl. i, 281 (1755).

Marshes, Granite Station, Kootenai County; July 30 (No. 810).

ONAGRACEÆ.

Epilobium adenocaulon Hausskn. Est. Bot. Zeitschr. xxix, 119 (1879).

Common in wet places, Upper Ferry, Clearwater River, above Lewiston; May 30 (No. 275).

Epilobium anagallidifolium Lam. Encycl. ii, 376 (1786).

The plants are young, and the determination is not certain. The petioled leaves forbid that this should be *E. oregonense* Hausskn.[1]

Crevices of rocks at 2,600 meters altitude, Packsaddle Peak, Kootenai County; August 5 (No. 844). Springy places, same locality; August 6 (No. 855).

Epilobium franciscanum Barbey; Brewer & Wats. Bot. Cal. i, 220 (1876).

Moist places, valley of Mud Lake, Kootenai County; July 25 (No. 737).

Epilobium halleanum Hausskn. Monogr. Gat. Epi. 261 (1884).

Frequent in meadows, head of Little Potlatch River, Latah County; June 16 (No. 397).

Epilobium hornemanni Reichenb. Icon. Crit. ii, 73 (1824).

Crevices of rocks, subalpine, near south end of Lake Pend d'Oreille; July 27 (No. 746).

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[1] Monogr. Gatt. Epil. 276, pl. 14, fig. 66 (1884).

Epilobium lineare Muhl. Cat. 39 (1813).

Marshes, Granite Station, Kootenai County; July 30 (No. 802).

Epilobium minutum Lindl.; Hook. Fl. Bor. Amer. i, 207 (1834).

Moist rocks at 1,100 meters altitude, Cedar Mountain, Latah County; June 17 (No. 423).

Epilobium paniculatum Nutt.; Torr. & Gr. Fl. i, 490 (1840).

Sandy soil, valley of Spokane River, Kootenai County; June 16 (No. 656). Common on hillsides, head of Little Potlatch River, Latah County; June 21 (No. 477).

Epilobium ursinum Parish; Trelease, Rep. Mo. Bot. Gard. 100 (1891).

Frequent in meadows, head of Little Potlatch River, Latah County; June 16 (No. 409).

Chamænerion angustifolium (L.) Scop. Fl. Carn. ed. 2, i, 271 (1772); *Epilobium angustifolium* L. Sp. Pl. i, 347 (1753); *E. spicatum* Lam. Fl. Fr. iii, 482 (1778).

Waste places, south end of Lake Pend d'Oreille, Kootenai County; August 1 (No. 818).

Clarkia pulchella Pursh, Fl. i, 260, t. 11 (1814).

Common on hillsides, valley of Hatwai Creek, Nez Perces County; May 14 (No. 171).

Clarkia rhomboidea Dougl.; Hook. Fl. Bor. Amer. i, 214 (1834).

Sandy soil, valley of Pine Creek, Latah County; June 29 (No. 526).

Gayophytum ramosissimum Torr. & Gr. Fl. i, 513 (1840).

Gravelly soil, along railroad, valley of Spokane River, Kootenai County; July 14 (No. 652).

Onagra biennis (L.) Scop. Fl. Carn. ed. 2, i, 269 (1772); *Œnothera biennis* L. Sp. Pl. i, 346 (1753).

Waste places near Rathdrum, Kootenai County; July 25 (No. 717).

Œnothera cæspitosa Nutt. Fraser's Cat. No. 53 (1813).

On rocky slopes at Lewiston; May 17 (No. 185).

Boisduvalia densiflora (Lindl.) Wats. Bot. Cal. i, 233 (1876); *Œnothera densiflora* Lindl. Bot. Reg. xix, t. 1593 (1833); *Boisduvalia douglasii* Spach, Monogr. Onagr. 80, t. 31, fig. 2 (1835).

Moist places, Spokane, Washington; August 17 (No. 922).

Boisduvalia stricta (Gray) Greene, Fl. Franc. 225 (1891); *Gayophytum strictum* Gray, Proc. Amer. Acad. vii, 340 (1868).

Basaltic soils, Spokane, Washington; August 16 (No. 905).

Circæa pacifica Ascherson & Magnus, Bot. Zeit. xxix, 392 (1871).

Rocky hillsides, east of Lewiston; June 2 (No. 289).

LOASACEÆ.

Mentzelia dispersa Wats. Proc. Amer. Acad. xi, 137 (1876).

Sandy hillsides near Upper Ferry, Clearwater River, above Lewiston; May 9 (No. 144).

Mentzelia lævicaulis (Dougl.) Torr. & Gr. Fl. i, 535 (1840); *Bartonia lævicaulis* Dougl.; Hook. Fl. Bor. Amer. i, 221 (1834).

Gravelly banks of Spokane River, Kootenai County; July 15 (No. 651).

Mentzelia ornata (Pursh) Torr. & Gr. Fl. i, 534 (1840); *Bartonia ornata* Pursh, Fl. i, 326 (1814).

Plains, Colgate near Glendive, Dawson County, Montana; September 6 (No. 1033).

CACTACEÆ.

Opuntia missouriensis DC. Prodr. iii, 472 (1828).

Rocky hillsides, Upper Ferry, Clearwater River, above Lewiston; May 31 (No. 281).

AIZOACEÆ.

Mollugo verticillata L. Sp. Pl. i, 89 (1753).

Seeds nearly glabrous, and without the coiled lines of dots; otherwise as this species.

Sandy soil near Spokane Bridge, 18 miles east of Spokane, Washington; August 15 (No. 899)

UMBELLIFERÆ.[1]

Sanicula marilandica L. Sp. Pl. i, 235 (1753).

Springy places near south end of Lake Pend d'Oreille; July 28 (No. 763).

Cicuta bulbifera L. Sp. Pl. i, 255 (1853).

Meadows at Granite Station, Kootenai County; July 29 (No. 789).

Cicuta virosa maculata (L.) Coult. & Rose, Rev. Umbel. 130 (1888); *Cicuta maculata* L. Sp. Pl. i, 256 (1753).

Wet meadows, valley of Lake Tesemini, Kootenai County; July 21 (No. 686).

Carum gairdneri (Hook. & Arn.) Gray, Proc. Amer. Acad. vii, 344 (1868); *Atænia gairdneri* Hook. & Arn. Bot. Beech. 349 (1840).

Copses, south end of Lake Pend d'Oreille; August 4 (No. 823).

Sium cicutæfolium Gmelin, Syst. ii, 482 (1791). A pre-Linnæan species.

Moist places, valley of Mud Lake, near Rathdrum, Kootenai County; July 25 (No. 733).

Osmorhiza nuda Torr. Pacif. R. Rep. iv, 93 (1857).

Rich, moist soil, valley of Hatwai Creek, Nez Perces County; May 14 (No. 168). Moist places at 2,600 meters altitude, Packsaddle Peak, Kootenai County; August 6 (No. 845).

Osmorhiza occidentalis (Nutt.) Torr. Bot. Mex. Bound. 71 (1859); *Glycosma occidentalis* Nutt.; Torr. & Gr. Fl. i, 639 (1840).

Frequent in wet places, Clearwater River, at mouth of Big Potlatch, Nez Perces County; May 3 (No. 108).

Ligusticum scopulorum Gray, Proc. Amer. Acad. vii, 347 (1868).

In rich canyons, Farmington Landing, Lake Cœur d'Alene; July 2 (No. 535).

Angelica dawsonii Wats. Proc. Amer. Acad. xx, 369 (1885).

Along creeks in the valley of Traille River, Kootenai County; August 10 (No. 889).

Angelica lyallii Wats. Proc. Amer. Acad. xvii, 374 (1882).

Canyons at Farmington Landing, Lake Cœur d'Alene; July 6 (No. 565). Frequent in wet places, valley of Little Potlatch River, Latah County; June 14 (No. 393).

Peucedanum ambiguum Nutt.; Torr & Gr. Fl. i, 626 (1840); *Eulophus ambiguus* Nutt. Journ. Acad. Phila. vii, 27 (1834).

Rocky banks of streams, valley of Peter Creek, Nez Perces County; May 4 (No. 125). Gravelly banks of Spokane River, Kootenai County; July 16 (No. 659).

Peucedanum bicolor Wats. Bot. King Surv. 129 (1871).

Slopes of Wiessner's Peak, on the St. Joseph River, Kootenai County; July 8 (No. 596).

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[1]The Umbelliferæ were determined by Mr. J. N. Rose, assistant botanist, Department of Agriculture.

Peucedanum canbyi Coult. & Rose, Bot. Gaz. xiii, 78 (1888).

Northern slopes, Upper Ferry, Clearwater River, above Lewiston; May 10 (No. 150).

Peucedanum circumdatum Wats. Proc. Amer. Acad. xxii, 474 (1887).

On basaltic rocks, Upper Ferry, Clearwater River, above Lewiston; April 24 (No. 21).

Peucedanum geyeri Wats. Proc. Amer. Acad. xiv, 293 (1879).

Basaltic rocks on Hatwai Creek and south side of Clearwater River, Nez Perces County; April 30 (No. 82).

Peucedanum grayi Coult. & Rose, Bot. Gaz. xiii, 209 (1888); *P. millefolium* Wats. Bot. King Surv. 129 (1871), not Sonder.

Hillsides, Upper Ferry, Clearwater River, above Lewiston; April 24 (No. 22). Also vicinity of Lake Waha and on Clearwater River near mouth of Big Potlatch.

Peucedanum macrocarpum Nutt.; Torr. & Gr. Fl. i, 627 (1840).

Frequent on hillsides, Upper Ferry, Clearwater River, above Lewiston; April 26 (No. 52).

Peucedanum salmoniflorum Coult. & Rose, sp. nov.

Short-caulescent or sometimes tall, 30 to 45 cm. high, bearing 3 or 4 leaves, glabrous throughout: leaves large, ternately compound, finely dissected; ultimate segments short, filiform; involucre none; bracts of the involucels few, filiform; rays of the umbel few (4 to 10), somewhat unequal, 2.5 to 5 cm. long; pedicels 8 to 12 mm. long; fruit oblong, 10 mm. long, glabrous; carpel strongly flattened dorsally, with a broad layer of corky cells on the ventral face; dorsal and intermediate ribs low and obtuse; lateral wings narrow, thick, and corky; oil tubes solitary in the intervals, 2 on the commisural side; seed strongly flattened, somewhat constricted near the middle, not grooved under the oil tubes; stylopodium none; flowers salmon-colored.

A species with much the habit and foliage and with the lateral wings of *Leptotænia*, but differing in having oil tubes and distinct dorsal and intermediate ribs.

On basaltic rocks, near Upper Ferry, Clearwater River, above Lewiston; April 24 (No. 24). Rocky hillsides, island in Clearwater River, same vicinity; May 2 (No. 94).

Peucedanum triternatum robustius Coult. & Rose; *P. triternatum macrocarpum* Coult. & Rose, Rev. Umbel. 70 (1888), not *P. macrocarpum* Nutt.

Basaltic rocks, Upper Ferry, Clearwater River, above Lewiston; April 24 (No. 28).

Heracleum lanatum Mx. Fl. i, 166 (1803).

Frequent along streams, valley of Hatwai Creek, Nez Perces County; May 24 (No. 252).

Leptotænia dissecta Nutt.; Torr. & Gr. Fl. i, 630 (1840).

Hillsides, Craig Mountains, near Lake Waha, Nez Perces County; May 21 (No. 227).

Leptotænia multifida Nutt.; Torr. & Gr. Fl. i, 630 (1840).

Frequent on rich hillsides, Upper Ferry, above Lewiston, Nez Perces County; May 2 (No. 103).

Caucalis microcarpa Hook. & Arn. Bot. Beech. 348 (1840).

Rocky creek bottoms on Little Potlatch River, Nez Perces County; June 7 (No. 328).

ARALIACEÆ.

Aralia nudicaulis L. Sp. Pl. i, 274 (1753).

Woods, south end of Lake Pend d'Oreille; July 28 (No. 772).

Echinopanax horridum (Smith) Dec. & Planch. Rev. Hort. 1854, 105 (1854); *Panax horridum*, Smith in Rees's Cycl. xxvi, no. 10 (1819); *Fatsia horrida* Benth. & Hook. Gen. Pl. i, 939 (1867).

Springy places, Lake View, Kootenai County; August 7 (No. 867). A large tree.

CORNACEÆ.

Cornus canadensis L. Sp. Pl. i, 118 (1753).

Woods at 1,000 meters altitude, Cedar Mountain, Latah County; June 20 (No. 463).

Cornus stolonifera Mx. Fl. i, 92 (1803).

Common along creeks, near Upper Ferry, Clearwater River, above Lewiston; May 9 (No. 143).

CAPRIFOLIACEÆ.

Sambucus glauca Nutt.; Torr. & Gr. Fl. ii, 13 (1841).

Frequent along creeks, near Upper Ferry, Clearwater River, above Lewiston; May 31 (No. 283). Woods, south end of Lake Pend d'Oreille; August 1 (No. 813).

Sambucus melanocarpa Gray, Proc. Amer. Acad. xix, 76 (1883).

Occasional on river banks, Lapwai Agency, Nez Perces County; May 5 (No. 128). Canyons, near Rathdrum, Kootenai County; July 23 (No. 709). Moist places on grassy slopes at 2,550 meters altitude, Packsaddle Peak, Kootenai County; August 6 (No. 857).

Symphoricarpos occidentalis Hook. Fl. Bor. Amer. i, 285 (1834).

Frequent in copses, Upper Ferry, Clearwater River, above Lewiston; May 30 (No. 270). Rocky hillsides on the Little Potlatch River, Nez Perces County; June 6 (No. 335). Copses, south end of Lake Pend d'Oreille; August 24 (No. 952).

Linnæa borealis L. Sp. Pl. ii, 631 (1753).

Common in woods, Bald Knob, Cedar Mountain, Latah County; June 20 (No. 441).

Lonicera ciliosa (Pursh) Poir. Encycl. v, 612 (1817); *Caprifolium ciliosum* Pursh, Fl. i, 160 (1814).

Common on hillsides and in copses, valley of Little Potlatch River, Latah County; June 13 (No. 390).

Lonicera involucrata (Richards.) Banks; Richards. Bot. App. ed. 2, 6 (1823); *Xylosteum involucratum* Richards. Bot. App. ed. 2, 6 (1823).

Bank of St. Joseph River at Wiessner's Peak, Kootenai County; July 28 (No. 597).

Lonicera utahensis Wats. Bot. King Surv. 133 (1871).

Woods, Craig Mountains near Waha, Nez Perces County; May 21 (No. 221); May 23 (No. 286). North slope, near summit of Wiessner's Peak, Kootenai County; July 8 (No. 590). Also on Clearwater River near mouth of Big Potlatch, near Viola, Latah County, and near south end of Lake Pend d'Oreille.

RUBIACEÆ.

Galium aparine L. Sp. Pl. i, 108 (1753).

Common on rocks and in copses, island in Clearwater River, near Upper Ferry, above Lewiston; April 30 (No. 83).

Galium boreale L. Sp. Pl. i, 108 (1753).

Frequent in low grounds, valley of Big Potlatch River, Nez Perces County; June 6 (No. 322).

Galium trifidum L. Sp. Pl. i, 105 (1753).

Common in wet places, head of Little Potlatch River, Latah County; June 17 (No. 416). Woods on the St. Joseph River, at 1,800 meters altitude, Wiessner's Peak, Kootenai County; July 8 (No. 600).

Galium triflorum Mx. Fl. i, 80 (1803).

Wet woods, Pine Creek, 4 miles east of Farmington, Latah County; June 29 (No. 525).

VALERIANACEÆ.

Valeriana edulis Nutt.; Torr. & Gr. Fl. ii, 48 (1841).

Grassy slopes, Craig Mountains, near Lake Waha, Nez Perces County; May 24 (No. 240). Also valley of Little Potlatch River.

Valeriana sylvatica Banks; Richards. Bot. App. 730 (1823).

At 1,500 meters altitude, sides of Wiessner's Peak, Kootenai County; July 8 (No. 587).

Valerianella congesta Lindl. Bot. Reg. xiii, t. 1095 (1827); *Plectritis congesta* DC. Prodr. iv, 631 (1830).

Common in shady places, Upper Ferry, Clearwater River, above Lewiston; April 26 (No. 55).

Valerianella olitoria Poll. Hist. Pl. Palat. i, 30 (1776).

Grassy meadows, Lewiston, valley of Clearwater River; May 13 (No. 157).

COMPOSITÆ.

Coleosanthus grandiflorus (Hook.) Kuntze, Rev. Gen. Pl. 328 (1891); *Eupatorium grandiflorum* Hook. Fl. Bor. Amer. ii, 26 (1834); *Brickellia grandiflora* Nutt. Trans. Amer. Phil. Soc. n. ser. vii, 287 (1841).

On precipitous ledges of granite, near south end of Lake Pend d'Oreille; July 27 (No. 749).

Coleosanthus oblongifolius (Nutt.) Kuntze, Rev. Gen. Pl. 328 (1891); *Brickellia oblongifolia* Nutt. Trans. Amer. Phil. Soc. n. ser. vii, 288 (1841).

In sandy soil, Spokane Bridge, 18 miles east of Spokane, Washington; August 17 (No. 911).

Lacinaria punctata (Hook.) Kuntze, Rev. Gen. Pl. i, 349 (1891); *Liatris punctata* Hook. Fl. Bor. Amer. i, 306 (1834).

Plains, Colgate, near Glendive, Dawson County, Montana; Sept. 6 (No. 1020).

Gutierrezia euthamiæ (Nutt.) Torr. & Gr. Fl. ii, 193 (1842); *Brachyris euthamiæ* Nutt. Gen. ii, 163 (1818).

Sandy soil, Bonner Missoula County, Montana; August 30 (No. 993). Sandy soil, Colgate, near Glendive, Dawson County, Montana; September 4 (No. 993).

Grindelia nana Nutt. Trans. Amer. Phil. Soc. vii, 314 (1841).

Sandy soil, near Granite Station, Kootenai County; July 29 (No. 784). Near Thompson Falls, Montana; August 28 (No. 1836).

Grindelia squarrosa (Pursh) Dunal, Mem. Mus. H. N. Par. v. 50, fide DC. Prodr. v, 315 (1836); *Donia squarrosa* Pursh, Fl. ii, 559 (1814).

Sandy soil near Bonner, Missoula County, Montana; August 31 (No. 991).

Chrysopsis villosa hispida (Hook.) Gray, Syn. Fl. i, pt. ii, 123 (1884); *Diplopappus hispidus* Hook. Fl. Bor. Amer. ii, 22 (1834.)

Common on sandy soil, Upper Ferry, Clearwater River, above Lewiston; May 31 (No. 280). Sandy plains, valley of Spokane River, Kootenai County; July 17 (No. 664). On precipitous ledges of granite, near south end of Lake Pend d'Oreille; July 27 (No. 752).

Pyrrocoma carthamoides Hook., Fl. Bor. Amer. i, 306, t. 107 (1834); *Aplopappus carthamoides* Gray, Proc. Acad. Phila. xv, 65 (1863).

Sandy places, Granite Station, Kootenai County; July 29 (No. 785).

Eriocarpum spinulosum (Pursh) Greene, Erythea, ii, 108 (1894); *Amellus spinulosus* Pursh, Fl. ii, 564 (1814); *Aplopappus (?) spinulosus*, DC. Prodr. v, 347 (1836).

Plains, Colgate, near Glendive, Dawson County, Montana; September 5 (No. 1000).

Bigelovia douglasii Gray, Proc. Amer. Acad. viii, 645 (1873).

Sandy soil, Colgate, near Glendive, Dawson County, Montana; September 4 (No. 994).

Bigelovia graveolens (Nutt.) Gray, Proc. Amer. Acad. viii, 644 (1873); *Chrysocoma graveolens* Nutt. Gen. ii, 136 (1818).

On buttes, Colgate, near Glendive, Dawson County, Montana; September 6 (No. 1007).

Bigelovia graveolens albicaulis Gray, Proc. Amer. Acad. viii, 645 (1873).

Sandy soil, Bonner, Missoula County, Montana; August 31 (No. 992).

Bigelovia graveolens glabrata Gray, Proc. Amer. Acad. viii, 645 (1873).

Sandy plains, near Spokane, Washington; August 17 (No. 913).

Solidago elongata Nutt. Trans. Amer. Phil. Soc. n. ser. vii, 328 (1841).

Grassy slopes at 1,200 meters altitude, near Rathdrum, Kootenai County; July 20 (No. 671).

Solidago missouriensis Nutt. Journ. Acad. Phila. vii, 32 (1834).

Woods at Farmington Landing, Lake Coeur d'Alene; July 11 (No. 614).

Solidago occidentalis Nutt.; Torr. & Gr. Fl. ii, 226 (1842).

River banks, Spokane Bridge, 18 miles east of Spokane, Washington; August 16 (No. 909).

Solidago radula Nutt. Journ. Acad. Phila. vii, 102 (1834).

Bad Lands at Colgate, near Glendive, Dawson County, Montana; September 4 (No. 995). Plains, near the same place, September 5 (No. 1001).

Solidago serotina Ait. Hort. Kew. iii, 211 (1789).

Shores of Mud Lake, Kootenai County; July 25 (Nos. 728, 730).

Aster adscendens Lindl.; Hook. Fl. Bor. Amer. ii, 8 (1834).

Marshes, near Granite Station, Kootenai County; July 30 (No. 804). Meadows near Hope, north end of Lake Pend d'Oreille; August 25 (No. 957).

Aster canescens Pursh, Fl. ii, 547 (1814).

On basaltic rocks, Spokane, Washington; August 17 (No. 912). Plains, Colgate, near Glendive, Dawson County, Montana; September 5 (No. 1004).

Aster incanopilosus (Lindl.) Sheldon, Bull. Torr. Club, xx, 286 (1893); *A. ramulosus incanopilosus* Lindl.; DC. Prodr. v, 243 (1836); *A. multiflorus commutatus* Torr. & Gr. Fl. ii, 125 (1841); *Aster commutatus* Gray, Syn. Fl. i, pt. ii, 185 (1884).

Plains, Colgate, near Glendive, Dawson County, Montana; September 5 (No. 998). Same locality; September 6 (No. 1021).

Aster conspicuus Lindl.; Hook. Fl. Bor. Amer. ii, 7 (1840); *Aster macdougali* Coult. & Fish. Bot. Gaz. xviii, 301 (1893).

Woods, near Farmington Landing, Lake Cœur d'Alene; July 9 (No. 550).

Aster engelmanni (Eaton) Gray, Bot. King Surv. 144 (1871); *A. elegans engelmanni* Eaton, Bot. King Surv. loc. cit.

Grassy slopes near summit of Packsaddle Peak, Kootenai County; August 5 (No. 839).

Aster foliaceus Lindl.; DC. Prodr. v, 228 (1836).

Woods near Farmington Landing, Lake Cœur d'Alene; July 12 (No. 625).

Aster fremonti (Torr. & Gr.) Gray, Syn. Fl. i, pt. ii, 191 (1888); *A. adscendens fremonti* Torr. & Gr. Fl. ii, 503 (1843).

Alluvial soil, Lake View, Kootenai County; August 6 (No. 868). Mountain meadows, valley of Traille River, Kootenai County; August 9 (No. 877). River banks, Thompson Falls, Montana; August 28 (No. 980).

Aster lævis L. Sp. Pl. ii, 876 (1753).

Moist copses, near Hope, north end of Lake Pend d'Oreille; August 25 (No. 953).

Aster modestus Lindl.; Hook. Fl. Bor. Amer. ii, 8 (1834).

Along creeks, south end of Lake Pend d'Oreille; July 28 (No. 764).

Aster multiflorus Ait. Hort. Kew. iii, 203 (1789).

Dry soil near Spokane, Washington; August 17 (No. 917).

Aster sibiricus L. Sp. Pl. ii, 872 (1753).

On precipitous ledges of granite, subalpine, near south end of Lake Pend d'Oreille; July 27 (No. 759).

Aster stenomeres Gray, Proc. Amer. Acad. xvii, 209 (1882).

Grassy mountain slopes at 1,200 meters altitude, near Rathdrum, Kootenai County; July 20 (No. 672).

Aster tanacetifolius H. B. K. Nov. Gen. & Sp. iv, 95 (1820).

Plains at Colgate, near Glendive, Dawson County, Montana; September 6 (No. 1017).

Erigeron acris L. Sp. Pl. ii, 863 (1753).

Sandy soil, valley of Lake Tesemini, Kootenai County; July 22 (No. 705).

Erigeron acris debilis Gray, Syn. Fl. i, pt. ii, 220 (1884).

Crevices of rocks, summit of Packsaddle Peak, 2,600 meters altitude, Kootenai County; August 5 (No. 847). Ligules very fine and slender.

Erigeron canadensis L. Sp. Pl. ii, 863 (1753).

Waste places near Rathdrum, Kootenai County, July 25 (No. 731).

Erigeron compositus pinnatisectus Gray, Proc. Amer. Acad. xvi, 90 (1880).

Gravelly banks, Upper Ferry, Clearwater River, above Lewiston, April 26 (No. 48). Also near mouth of Big Potlatch River.

Erigeron concinnus (Hook. & Arn.) Gray, Syn. Fl. i, pt. ii, 210 (1888); *Distasis? concinna* Hook. & Arn. Bot. Beech. 350 (1841).

Frequent in sandy soil, Upper Ferry, Clearwater River, above Lewiston; June 2 (No. 294). Sandy plains, valley of Spokane River, Kootenai County; July 17 (No. 665).

Erigeron corymbosus Nutt. Trans. Amer. Phil. Soc. vii, 308 (1841).

Sandy soil at Farmington Landing, Lake Cœur d'Alene; July 12 (No. 628).

Erigeron divergens Torr. & Gr. Fl. ii, 175 (1841).

Sandy soil, Thompson Falls, Montana; August 28 (No. 979).

Erigeron filifolius Nutt. Trans. Amer. Phil. Soc. vii, 328 (1841).

Sandy plains, near Spokane, Washington; August 17 (No. 915).

Erigeron macranthus Nutt. Trans. Amer. Phil. Soc. vii, 310 (1841).

Frequent in sandy soil, Julietta, Latah County, June 8 (No. 338).

Erigeron ramosus (Walt.) B. S P. Cat. Pl. N. Y. (1888); *Doronicum ramosum* Walt. Fl. Car. 205 (1788).

Shores, Farmington Landing, Lake Cœur d'Alene; July 5 (No. 557).

Erigeron ramosus beyrichii (Fisch. & Mey.) Smith & Pound, Rep. Bot. Surv. Neb. ii, 11 (1893); *Stenactis beyrichii* Fisch. & Mey. Ind. Sem. Petrop. v, 27 (1838).

Sandy soil near Thompson Falls, Montana; August 27 (No. 976).

Erigeron speciosus DC. Prodr. v, 284 (1836).

Waste places, valley of Lake Tesemini, Kootenai County; July 21 (No. 681).

Antennaria carpathica pulcherrima Hook. Fl. Bor. Amer. i, 329 (1834).

Rocky hillsides, valley of Hatwai Creek, Nez Perces County; May 17 (No 181).

Antennaria dioica (L.) Gærtn. Fruct. ii, 410, t. 167 f. 3 (1791); *Gnaphalium dioicum* L. Sp. Pl. ii, 850 (1753).

Frequent in dry soil, valley of Little Potlatch River, Latah County; June 13 (No. 389).

Antennaria geyeri Gray, Pl. Fendl. 107 (1849).

Sandy plains near Spokane, Washington, August 17 (No. 916).

Antennaria luzuloides Torr. & Gr. Fl. ii, 430 (1843).

Sandy low grounds, valley of Big Potlatch River, Nez Perces County; June 4 (No. 313). Also valley and head of Little Potlatch River, Latah County.

Antennaria plantaginifolia (L.) Richards. Bot. App. ed. 2, 30 (1823); *Gnaphalium plantaginifolium* L. Sp. Pl. ii, 850 (1753).

Hillsides, Craig Mountains, near Lake Waha, Nez Perces County; May 27 (No. 229). Dry soil, Julietta, Latah County; June 8 (No. 339). Also valley and head of Little Potlatch River, Latah County.

Antennaria racemosa Hook. Fl. Bor. Amer. i, 330 (1834).

Frequent in shady woods, Cedar Mountain, Latah County; June 17 (No. 422).

Antennaria margaritacea (L.) Hook. Fl. Bor. Amer. i, 329 (1834); *Gnaphalium margaritaceum* L. Sp. Pl. ii, 850 (1753).

Frequent in sandy soil at 1,150 meters altitude, Bald Knob, Cedar Mountain, Latah County; June 20 (No. 465).

Gnaphalium decurrens Ives, Amer. Journ. Sci. i, 380 (1819).

Sandy soil, valley of Cœur d'Alene River, Kootenai County; July 12 (No. 635).

Gnaphalium microcephalum Nutt. Trans. Amer. Phil. Soc. n. ser. vii, 404 (1841).

Sandy soil, Lake View, Kootenai County; August 7 (No. 872).

Gnaphalium palustre Nutt. Trans. Amer. Phil. Soc. n. ser. vii, 404 (1841).

Frequent in moist places, valley of Little Potlatch River, Nez Perces County; June 7 (No. 329). Sandy soil, valley of Cœur d'Alene River, Kootenai County; July 13 (No. 647).

Gnaphalium sprengelii Hook. & Arn. Bot. Beech. 150 (1841).

Waste places, Granite Station, Kootenai County; July 29 (No. 783).

Adenocaulon bicolor Hook. Bot. Misc. i, 19, t. 15 (1830).

Frequent in woods, Bald Knob, Cedar Mountain, Latah County; June 20 (No. 443).

Iva axillaris Pursh, Fl. ii, 743 (1814).

Plains, Colgate, near Glendive, Dawson County, Montana; September 6 (1015).

Iva xanthifolia Nutt. Gen. ii, 185 (1818).

Waste grounds near Spokane, Washington; August 17 (No. 919).

Ambrosia psilostachya DC. Prodr. v, 526 (1836).

Near Hope, north end of Lake Pend d'Oreille; August 26 (No. 1031).

Gærtneria acanthicarpa (Hook.) Britton, Mem. Torr. Club, v. 332 (1894); *Ambrosia acanthicarpa* Hook. Fl. Bor. Amer. i, 309 (1834); *Franseria hookeriana* Nutt. Trans. Amer. Phil. Soc. n. ser. vii, 345 (1841).

Sandy soil at Colgate, near Glendive, Dawson County, Montana; September 4 (No. 1006).

Xanthium canadense Mill. Gard. Dict. ed. 8, no. 2 (1768).

Sandy banks, Spokane Bridge, 18 miles east of Spokane, Washington; August 17 (No. 910).

Rudbeckia laciniata L. Sp. Pl. ii, 906 (1753).

Copses on Hellgate River, Bonner, Missoula County, Montana; August 31 (No. 990).

Rudbeckia occidentalis Nutt. Trans. Amer. Phil. Soc. vii, 355 (1841).

Moist places near south end of Lake Pend d'Oreille; July 28 (No. 768).

Balsamorhiza hookeri Nutt. Trans. Amer. Phil. Soc. vii, 349 (1841).

Hillsides, Craig Mountains at Lake Waha, Nez Perces County; May 24 (No. 248).

Balsamorhiza sagittata (Pursh) Nutt. Trans. Amer. Phil. Soc. vii, 349 (1841); *Buphthalmum sagittatum* Pursh, Fl. ii, 564 (1814).

Common on hills, on Hatwai Creek, Nez Perces County; April 24 (No. 32).

Wyethia amplexicaulis (Nutt.) Nutt. Trans. Amer. Phil. Soc. vii, 349 (1841); *Espeletia amplexicaulis* Nutt. Journ. Acad. Phila. vii, 38 (1834).

Frequent on hillsides, Craig Mountains at Lake Waha, Nez Perces County; May 25 (No. 247).

Helianthuus annuus L. Sp. Pl. ii, 904 (1753).

Waste places at Mud Lake, near Rathdrum, Kootenai County; July 25 (No. 726).

Helianthus douglasii Torr. & Gr. Fl. ii, 332 (1842).

Frequent on sandy soil, valley of Big Potlatch River, Nez Perces County; June 6 (No. 321).

Coreopsis atkinsoniana Dougl.; Lindl. Bot. Reg. t. 1376 (1830).

On shores near Farmington Landing, Lake Cœur d'Alene; July 11 (No. 617).

Bidens frondosa L. Sp. Pl. ii, 832 (1753).

Wet places near Spokane, Washington; August 17 (No. 914).

Blepharipappus scaber Hook. Fl. Bor. Amer. i, 316 (1834).

On basaltic rocks, Upper Ferry, Clearwater River, above Lewiston; April 23 (No. 6). Also valley of Lake Waha, and Clearwater River near mouth of Big Potlatch.

Madia filipes Gray, Proc. Amer. Acad. viii, 391 (1872); *Harpæcarpus madarioides* Nutt. Trans. Amer. Phil. Soc. n. ser. vii (1841).

Dry hillsides, head of Little Potlatch River, Latah County; June 20 (No. 447). Sandy soil near Farmington Landing, Lake Cœur d'Alene; July 4 (No. 549).

Madia glomerata Hook. Fl. Bor. Amer. ii, 24 (1834).

Sandy soil, valley of Lake Tesemini, Kootenai County; July 22 (No. 696).

Madia sativa Molina; Don, Bot. Reg. xvii, t. 1458 (1831).

Frequent on rocky grounds, Upper Ferry, Clearwater River, above Lewiston; May 30 (No. 276).

Madia sativa racemosa (Nutt.) Gray, Bot. Cal. i, 359 (1876); *Madorella racemosa* Nutt. Trans. Amer. Phil. Soc. vii, 388 (1841).

Sandy soil, valley of Coeur d'Alene River, Kootenai County; July 13 (No. 640).

Lagophylla ramosissima Nutt. Trans. Amer. Phil. Soc. vii, 390 (1841).

Frequent on dry soil, Upper Ferry, Clearwater River, above Lewiston; May 17 (No. 193). Gravelly soil, valley of Spokane River, Kootenai County; July 16 (No. 654).

Chænactis douglasii (Hook.) Hook. & Arn. Bot. Beech. 354 (1840–41); *Hymenopappus douglasii* Hook. Fl. Bor. Amer. i, 316 (1834).

Gravelly soil, valley of Spokane River, Kootenai County; July 16 (No. 653).

Eriophyllum cæspitosum Lindl. Bot. Reg. xiv, t. 1167 (1828).

On rocks, Upper Ferry, Clearwater River, above Lewiston; May 16 (No. 180).

Rigiopappus leptocladus Gray, Proc. Amer. Acad. vi, 548 (1865).

Rocky hillsides, Upper Ferry, Clearwater River, above Lewiston; May 30 (No. 278).

Dysodia papposa (Vent.) Hitchcock, Trans. St. Louis Acad. v, 503 (1891); *Tagetes papposa* Vent. Hort. Cels. t. 36 (1800); *Babera chrysanthemoides* Willd. Sp. Pl. iii, 2125 (1804); *Dysodia chrysanthemoides* Lag. Nov. Gen. & Sp. 29 (1816).

Sandy soil, Colgate, near Glendive, Dawson County, Montana; September 5 (No. 1005).

Helenium autumnale L. Sp. Pl. ii, 886 (1753).

River banks, Colgate, near Glendive, Dawson County, Montana; September 6 (No. 1022).

Gaillardia aristata Pursh, Fl. ii, 573 (1814).

Common in sandy soil, Upper Ferry, Clearwater River, above Lewiston; May 30 (No. 273).

Gaillardia pulchella Foug. Mem. Acad. Sci. Par. 1786, 5 (1788).

Three miles south of Viola, Latah County; June 26 (No. 497).

Achillea millefolium L. Sp. Pl. ii, 899 (1753).

Common on hillsides, valley of Clearwater River, Nez Perces County; May 9 (No. 147).

Matricaria matricarioides (Less.) Porter, Mem. Torr. Club, v, 341 (1894); *Artemisia matricarioides* Less. Linnæa, vi, 210 (1831); *Matricaria discoidea* DC. Prodr. vi, 50 (1837).

Frequent in moist places, Upper Ferry, Clearwater River, Nez Perces County; May 9 (No. 149).

Artemisia dracunculoides Pursh, Fl. ii, 742 (1814).

River banks near Spokane, Washington; August 16 (No. 908). Sandy soil, Thompson Falls, Montana; August 27 (No. 975).

Artemisia frigida Willd. Sp. Pl. iii, 1838 (1804).

Sandy soil, Thompson Falls, Montana; August 28 (No. 981).

Artemisia gnaphalodes Nutt. Gen. ii, 143 (1818).

Shores at Farmington Landing, lake Cœur d'Alene; July 6 (No. 569). On precipitous ledges of granite, valley of Lake Pend d'Oreille; July 27 (No. 754). Rocks on lake shore, same locality; August 1 (No. 822). Sandy soil at Spokane, Washington; August 16 (No. 902).

Artemisia longifolia Nutt. Gen. ii, 142 (1818).

Plains, Colgate, near Glendive, Dawson County, Montana; September 6 (Nos. 1011, 1014).

Artemisia trifida Nutt. Trans. Amer. Phil. Soc. vii, 398 (1841).

Sandy soil at Bonner, Missoula County, Montana; August 30 (No. 984). Plains, Colgate, near Glendive, Dawson County, Montana; September 6 (No. 1010).

Tussilago sagittata Pursh, Fl. ii, 531 (1814); *Nardosmia sagittata* Hook. Fl. Bor. Amer. i, 307 (1834); *Petasites sagittata* Gray, Bot. Cal. i, 407 (1876).

Marshes, Granite Station, Kootenai County; July 30 (No. 805).

Arnica alpina Olin, Mon. Arn. Upsala (1799).

Frequent on hillsides, vicinity of Lake Waha, Nez Perces County; May 24 (No. 244). Rocky soil along Clearwater River, Nez Perces County; June 6 (No. 325).

Arnica cordifolia Hook. Fl. Bor. Amer. i, 331 (1833).

Frequent in woods and canyons, vicinity of Lake Waha, Nez Perces County; May 20 (No. 197).

Arnica latifolia Bong. Veg. Sitch. 147 (1833).

On precipitous ledges of granite, valley of Lake Pend d'Oreille; July 27 (No. 753).

Senecio aureus L. Sp. Pl. ii, 870 (1753). A large form.

Meadows at Granite Station, Kootenai County; July 30 (No. 803).

Senecio canus Hook. Fl. Bor. Amer. i, 333, t. 116 (1834).

Sandy plains, valley of Spokane River, Kootenai County; July 18 (No. 668).

Senecio hydrophilus Nutt. Trans. Amer. Phil. Soc. vii, 411 (1841).

Moist river banks, Spokane, Washington; August 18 (No. 924). Wet shores, valley of Lake Pend d'Oreille, Kootenai County; August 20 (No. 938).

Senecio lugens Richards. Bot. App. ed. 2, 31 (1823).

Frequent in wet places, valley of Big Potlatch River, Nez Perces County; June 9 (No. 363). Slopes on Wiessner's Peak, Kootenai County; July 8 (No. 609).

Senecio lugens exaltatus (Nutt.) Gray, Bot. Cal. i, (1876); *S. exaltatus* Nutt. Trans. Amer. Phil. Soc. vii, 410 (1841).

Rocky slopes, mouth of Big Potlatch River, Nez Perces County; May 3 (No. 109). Also vicinity of Lake Waha.

Senecio serra Hook. Fl. Bor. Amer. i, 332 (1834).

Valley of Traille River, Kootenai County; August 10 (No. 890).

Senecio triangularis Hook. Fl. Bor. Amer. i, 332, t. 115 (1834).

Along streams, valley of Pine Creek, Farmington, Latah County; June 29 (No. 524).

Senecio vulgaris L. Sp. Pl. ii, 867 (1753).

Frequent in moist places, Julietta, Latah County; June 8 (No. 343).

Tetradymia canescens DC. Prodr. vi, 440 (1837).

Dry hillsides, Spokane, Washington; August 19 (No. 930).

Carduus drummondii (Torr. & Gr.) Coville, Contr. Nat. Herb. iv, 142 (1893); *Cirsium drummondii* Torr. & Gr. Fl. ii, 459 (1843).

Meadows, head of Little Potlatch River, Latah County; June 16 (No. 395).

Carduus foliosus Hook. Fl. Bor. Amer. i, 303 (1833); *Cnicus foliosus* Gray, Proc. Amer. Acad. x, 40 (1874).

Woods near Granite Station, at the south end of Lake Pend d'Oreille, Kootenai County; July 29 (No. 773).

Carduus remotifolius Hook. Fl. Bor. Amer. i, 302 (1834); *Cnicus remotifolius* Gray, Proc. Amer. Acad. xix, 56 (1883).

Sparingly in meadows at Viola, Latah County; June 25 (No. 489).

Carduus undulatus Nutt. Gen. ii, 130 (1818); *Cnicus undulatus* Gray, Proc. Amer. Acad. x, 42 (1874).

Sandy soil at the north end of Lake Pend d'Oreille; August 25 (No. 964).

Carduus undulatus megacephalus (Gray) Greene, Proc. Acad. Phila. 1892, 360 (1893); *Cnicus undulatus megacephalus* Gray, Proc. Amer. Acad. x, 42 (1874).

Frequent on hillsides, valley of Clearwater River, Nez Perces County; May 30 (No. 272).

Saussurea americana Eaton, Bot. Gaz. vi, 283 (1881).

Mountain meadows, valley of Traille River, Kootenai County; August 9 (No. 879).

Centaurea cyanus L. Sp. Pl. ii, 911 (1753).

Hillsides, Viola, Latah County; June 26 (No. 495).

Microseris linearifolia (DC.) Gray, Proc. Amer. Acad. ix, 211 (1874); *Calais linearifolia* DC. Prodr. vii, 85 (1839).

Common in sandy soil, valley of Clearwater River, Nez Perces County; April 24 (No. 18).

Microseris nutans (Hook.) Gray, Proc. Amer. Acad. ix, 208 (1874); *Scorzonella nutans* Hook. Lond. Journ. Bot. vi, 253 (1847).

Hillsides, vicinity of Lake Waha, Nez Perces County; May 22 (No. 225). Copses, valley of Big Potlatch River, Nez Perces County; June 9 (No. 371). Cedar Mountain, Latah County; June 17 (No. 429). Also valley of Little Potlatch River and near Viola, Latah County.

Crepis acuminata Nutt. Trans. Amer. Phil. Soc. n. ser. vii, 437 (1841).

Rocky places, valley of Clearwater River, Nez Perces County; June 4 (No. 303); rocky hillsides, scarce, valley of Big Potlatch River, Nez Perces County; June 6 (No. 326). Also valley of Lake Waha and near Viola and Farmington, Latah County.

Crepis occidentalis Nutt. Journ. Acad. Phila. vii, 29 (1834); *Psilochenia occidentalis* Nutt. Trans. Amer. Phil. Soc. vii, 437 (1841).

Frequent in rocky soil, valley of Clearwater River, Nez Percez County; May 30 (No. 268).

Hieracium albiflorum Hook. Fl. Bor. Amer. i, 298 (1834).

Woods, valley of Pine Creek, Farmington, Latah County; June 28 (No. 509).

Hieracium canadense Mx. Fl. ii, 86 (1803).

Canyons near Farmington Landing, Lake Cœur d'Alene; July 7 (No. 573).

Hieracium gracile detonsum Gray, Syn. Fl. i, pt. ii, 427 (1884).

Grassy slopes near summit of Packsaddle Peak, Kootenai County; August 5 (No. 835).

Hieracium scouleri Hook. Fl. Bor. Amer. i, 289 (1834).

Woods near Farmington Landing, Lake Cœur d'Alene July 5 (No. 560). Canyons, same locality; July 7 (No. 574).

Nothocalais cuspidata (Pursh) Greene, Bull. Cal. Acad. ser. 2, ii, 55 (1886); *Troximon cuspidatum* Pursh, Fl. ii, 472 (1814).

Common on hillsides, along Hatwai Creek, Nez Perces County; April 30 (No. 77).

Agoseris aurantiaca (Hook) Greene, Pittonia, ii, 177 (1891); *Troximon aurantiacum* Hook. Fl. Bor. Amer. i, 300, t. 104 (1834).

Moist places at 2,300 meters altitude, Packsaddle Peak, Kootenai County; August 6 (No. 862).

Agoseris elata (Nutt.) Greene, Pittonia, ii, 177 (1891); *Stylopappus elatus* Nutt. Trans. Amer. Phil. Soc. vii, 433 (1841).

Rocky soil, valley of Big Potlatch River, Nez Perces County; June 6 (No. 324). Also valley and head of Little Potlatch River.

Agoseris grandiflora (Nutt.) Greene, Pittonia, ii, 178 (1891); *Stylopappus grandiflorus* Nutt. Trans. Amer. Phil. Soc. vii, 435 (1841).

Meadows, valley of Cœur d'Alene River, Kootenai County; July 12 (No. 633).

Agoseris hirsuta (Hook.) Greene, Pittonia, ii, 177 (1891); *Leontodon hirsutum* Hook. Fl. Bor. Amer. i, 296 (1834).

Common on hillsides, valley of Clearwater River, Nez Perces County; April 23 (No. 12).

Agoseris laciniata (Nutt.) Greene, Pittonia, ii, 178 (1891); *Stylopappus laciniatus* Nutt. Trans. Amer. Phil. Soc. vii, 435 (1841).

Frequent in meadows, Viola, Latah County; June 25 (No. 488).

Taraxacum taraxacum (L.) Karst. Deutsch. Flora, 1138 (1880–83); *Leontodon taraxacum* L. Sp. Pl. ii, 798 (1753).

Common on lowlands, valley of Hatwai Creek, Nez Perces County; April 25 (No. 42).

Lactuca spicata (Lam.) Hitchcock, Trans. St. Louis Acad. v, 506 (1891); *Sonchus spicatus* Lam. Encycl. iii, 401 (1789); *Sonchus leucophæus* Willd. Sp. Pl. iii, 1520 (1800); *Lactuca leucophæa* Gray, Proc. Amer. Acad. xix, 73 (1883), not Sibth.

Waste grounds, valley of Lake Tesemini, Kootenai County; July 22 (No. 706).

Prenanthes alata sagittata Gray, Syn. Fl. i, pt. ii, 435 (1884).

Crevices of rocks, valley of Traille River, Kootenai County; August 10 (No. 887).

Sonchus oleraceus L. Sp. Pl. ii, 794 (1753).

Common on waste grounds, valley of Hatwai Creek, Nez Perces County; May 27 (No. 251).

Lygodesmia juncea (Pursh) Don, Edinb. N. Phil. Journ. vi, 311 (1828–29); *Prenanthes juncea* Pursh, Fl. ii, 498 (1814).

Sandy soil, Colgate, near Glendive, Dawson County, Montana; September 5 (No. 1003).

Ptiloria tenuifolia (Torr.) Raf. Atl. Journ. 145 (1832); *Prenanthes* (?) *tenuifolia* Torr. Ann. Lyc. N. Y. ii, 210 (1827); *Lygodesmia minor* Hook. Fl. Bor. Amer. i, 205 (1834); *Stephanomeria minor* Nutt. Trans. Amer. Phil. Soc. n. ser. vii, 427 (1841).

Gravelly shores, valley of Cœur d'Alene River, Kootenai County; July 16 (No. 658).

LOBELIACEÆ.

Howellia aquatilis Gray, Proc. Amer. Acad. xv, 43 (1879).

Floating in subalpine lakes, valley of Lake Tesemini, Kootenai County; July 22 (No. 699).

Bolelia elegans (Dougl.) Greene, Pittonia, ii, 126 (1889); *Clintonia elegans* Dougl.; Lindl. Bot. Reg. xv, t. 1241 (1829); *Downingia elegans* Torr. Bot. Wilkes Exped. ii, 375 (1874).

Muddy shores, Farmington Landing, Lake Cœur d'Alene; July 2 (No. 536). Similar situations, valley of Lake Pend d'Oreille; August 21 (No. 942).

CAMPANULACEÆ.

Campanula rotundifolia L. Sp. Pl. i, 163 (1753).

Common on sandy soil, Julietta, Latah County; June 8 (No. 337).

Heterocodon rariflorum Nutt. Trans. Amer. Phil. Soc. viii, 255 (1843).

Sandy, moist places near Rathdrum, Kootenai County; July 25 (No. 712).

Legouzia perfoliata (L.) Britton, Mem. Torr. Club, v, 309 (1894); *Campanula perfoliata* L. Sp. Pl. i, 169 (1753); *Specularia perfoliata* DC. Monogr. Camp. (1830).

In woods, but scarce, region of Lake Waha, Nez Perces County; May 23 (No. 285).

VACCINIACEÆ.

Vaccinium cæspitosum Mx. Fl. i, 234 (1803).

Woods, region of Lake Waha, Nez Perces County; May 24 (No. 238).

Vaccinium membranaceum Dougl.; Hook. Fl. Bor. Amer. ii, 32 (1834), as synonym; *Vaccinium myrtilloides* Hook. loc. cit., not Mx.

Woods, vicinity of Lake Waha, Nez Perces County, May 20 (No. 195). Also near Viola, Latah County, and in valley of Spokane River, Kootenai County.

Vaccinium myrtillus L. Sp. Pl. i, 349 (1753).

Summit of Packsaddle Peak, at 2,700 meters altitude, near Lake Pend d'Oreille; August 5 (No. 829).

Vaccinium ovalifolium Smith in Rees's Cycl. no. 2 (1817).

Woods, valley of Lake Tesemini, Kootenai County; July 21 (No. 680).

ERICACEÆ.

Arctostaphylos uva-ursi (L.) Spreng. Syst. ii, 287 (1825); *Arbutus uva-ursi* L. Sp. Pl. i, 395 (1753).

Craig Mountains at 900 meters altitude, near Lake Waha, Nez Perces County; May 20 (No. 204).

Menziesia glabella Gray, Syn. Fl. ii, pt. i, 39 (1878).

Frequent in woods, Bald Knob, Cedar Mountain, Latah County; June 20 (No. 469).

Pyrola aphylla Smith in Rees's Cycl. xxix (1819-20).

Several of the numerous flowering specimens sent in by Dr. Sandberg have, at the base of the scape, developed leaves of the texture and color of those of *P. picta*, but smaller.

Valley of Spokane River, Kootenai County; July 17 (No. 663).

Pyrola chlorantha Swartz, Kongl. Vatensk. Acad. Handl. ser. 2, xxxi, 194, t. 5 (1810).

Valley of Pine Creek, near Farmington, Latah County; June 28 (No. 521).

Pyrola elliptica Nutt. Gen. i, 273 (1818).

Bottom land, on Cœur d'Alene River, near Harrison, Kootenai County; July 12 (No. 631).

Pyrola picta Smith in Rees's Cycl. xxix (1819-1820).

The flowers of this plant are greenish, as described. But in some specimens they assume a purplish tinge near their base, communicated, seemingly, from the scape and pedicels of the same color. No. 674 differs from No. 678 principally in the flowers being purplish-brown throughout, the anthers lighter-colored, and in the few, smaller leaves at the base of the scape. These, however, are quite of the same color, texture, and form as those of *P. picta*, which makes No. 674 intermediate between No. 663 (*P. aphylla*) and No. 678.

Wooded mountain slopes at 1,200 and 900 meters altitude, near Rathdrum, Kootenai County; July 20 (Nos. 674, 678).

Pyrola rotundifolia bracteata (Hook.) Gray, Syn. Fl. ii, pt. i, 48 (1878); *P. bracteata* Hook. Fl. Bor. Amer. ii, 47, 1834.

Woods, valley of Pine Creek, Farmington, Latah County; June 28 (No. 522).

Pyrola rotundifolia incarnata DC. Prodr. vii, 773 (1839).

Wooded slopes, near Lake Pend d'Oreille; August 3 (No. 821).

Pyrola secunda L. Sp. Pl. i, 396 (1753).

Woods, valley of Pine Creek, Farmington, Latah County, June 28 (No. 520).

Moneses uniflora (L.) Gray, Man. 273 (1848); *Pyrola uniflora* L. Sp. Pl. i, 397 (1753).

Frequent in canyons, at 1,000 meters altitude, Cedar Mountain, Latah County; June 20 (No. 462).

Chimaphila menziesii (R. Br.) Spreng. Syst. ii, 317 (1825); *Pyrola menziesii* R. Br.; D. Don, Mem. Wern. Soc. v, 245 (1823–24).

Woods, valley of Pine Creek, near Farmington, Latah County; June 28 (No. 1050).

Chimaphila umbellata (L.) Nutt. Gen. i, 274 (1818); *Pyrola umbellata* L. Sp. Pl. i, 396 (1753).

Woods, valley of Pine Creek, near Farmington, Latah County; June 28 (No. 519).

Pterospora andromedea Nutt. Gen. i, 269 (1818).

Sandy soil, valley of Pine Creek, near Farmington, Latah County; June 28 (No. 516).

Monotropa uniflora L. Sp. Pl. i, 387 (1753).

Deep woods, valley of Lake Pend d'Oreille; August 21 (No. 940).

Hypopitys multiflora Scop. Fl. Carn. i, 285 (1772).

Wooded slopes on Packsaddle Peak, Kootenai County; August 6 (No. 846).

PRIMULACEÆ.

Dodecatheon dentatum Hook. Fl. Bor. Amer. i, 119 (1830).

Heavily wooded ravines, Wiessner's Peak, Kootenai County; July 8 (No. 602).

Dodecatheon sp.

Moist places, valley of Hatwai Creek, Nez Perces County; April 28 (No. 63). Also valley of Clearwater River; near Viola, Latah County; and valley of Lake Cœur d'Alene.

Lysimachia thyrsiflora L. Sp. Pl. i, 147 (1753).

Moist shores, valley of Mud Lake, Kootenai County; July 25 (No. 735).

Steironema ciliatum (L.) Raf. Ann. Gen. Phys. Brux. vii, 192 (1820); *Lysimachia ciliata* L. Sp. Pl. i, 147 (1753).

Canyons near Farmington Landing, Lake Cœur d'Alene; July 7 (No. 580).

Trientalis europæa latifolia (Hook.) Torr. Pacif. R. Rep. iv, 118 (1856); *Trientalis latifolia* Hook. Fl. Bor. Amer. ii, 121 (1838).

Woods at 1,800 meters altitude, Wiessner's Peak, Kootenai County; July 11 (No. 612).

Centunculus mimimus L. Sp. Pl. i, 116 (1753).

Along dry creeks, near Rathdrum, Kootenai County; August 15 (No. 894).

APOCYNACEÆ.

Apocynum androsæmifolium pumilum Gray, Syn. Fl. ii, pt. i, 83 (1878).

Common in copses, valley of Big Potlatch River, Nez Perces County; June 9 (No. 372).

Apocynum cannabinum L. Sp. Pl. i, 213 (1753).

Shores, south end of Lake Pend d'Oreille; August 4 (No. 825).

ASCLEPIADACEÆ.

Asclepias mexicana Cav. Ic. Pl. i, 42, t. 58 (1791).

Sandy hillsides at Spokane Bridge, 18 miles east of Spokane, Washington; August 15 (No. 896).

Asclepias speciosa Torr. Ann. Lyc. N. Y. ii, 218 (1827).

Sandy soil, south end of Lake Pend d'Oreille; August 1 (No. 815).

GENTIANACEÆ.

Gentiana acuta Mx. Fl. i, 177 (1803).

Dry woods, at 1,000 meters altitude, Cedar Mountain, Latah County; June 17 (No. 424). Also head of Little Potlatch River; near Viola, Latah County; and near Farmington Landing, Lake Cœur d'Alene.

Gentiana oregana Engelm.; Gray, Syn. Fl. ii, pt. i, 122 (1886).

Sandy places near Rathdrum, Kootenai County; July 25 (No. 725).

Frasera albicaulis Griseb.; Hook. Fl. Bor. Amer. ii, 67 (1840).

Meadows, valley of Clearwater River, Nez Perces County; May 3 (No. 101). Also head of Little Potlatch River; near Viola, Latah County; and near Farmington Landing, Lake Cœur d'Alene.

Frasera speciosa Dougl.; Hook. Fl. Bor. Amer. ii, 66 (1838).

Frequent on grassy slopes, vicinity of Lake Waha, Nez Perces County; May 23 (No. 239).

Menyanthes trifoliata L. Sp. Pl. i, 145 (1753).

Marshes, south end of Lake Pend d'Oreille; August 11 (No. 828).

POLEMONIACEÆ.

Phlox gracilis (Dougl.) Greene, Pittonia, i, 141 (1887); *Collomia gracilis* Dougl.; Benth. Bot. Reg. xix, t. 1622 (1833).

Common on rocky hillsides, valley of Clearwater River, Nez Perces County, April 23 (No. 2). Frequent on sandy shores, island in Clearwater River near Upper Ferry, above Lewiston; May 2 (No. 84).

Phlox longifolia Nutt. Journ. Acad. Phila. vii, 41 (1834).

Common on hillsides, valley of Clearwater River, Nez Perces County; April 24 (No. 25).

Phlox speciosa Pursh, Fl. i, 149 (1814).

Frequent in shady places, valley of Lake Waha, Nez Perces County; May 24 (No. 242).

Collomia grandiflora Dougl.; Lindl. Bot. Reg. xiv, t. 1174, (1828); *Gilia grandiflora* Gray, Proc. Amer. Acad. xvii, 223 (1882).

Frequent on sandy banks, valley of Peter Creek, Nez Perces County, May 4 (No. 121). Sandy soil and in rocky places, valley of Big Potlatch River, Nez Perces County; June 4 (No. 304).

Collomia linearis Nutt. Gen. i, 126 (1818); *Gilia linearis* Gray, Proc. Amer. Acad. xvii, 223 (1882).

Common on hillsides, valley of Clearwater River, Nez Perces County; April 26 (No. 46).

Gilia aggregata (Pursh) Spreng. Syst. i, 626 (1825); *Cantua aggregata* Pursh, Fl. i, 147 (1814).

Frequent in rich canyons, valley of Clearwater River, Nez Perces County; May 17 (No. 188). Hillsides near Viola, Latah County; June 26 (No. 492).

Gilia capillaris Kellogg, Proc. Cal. Acad. v, 46 (1875).

Along the railroad, near Hope, north end of Lake Pend d'Oreille, August 20 (No. 936).

Gilia capitata Dougl.; Sims, Bot. Mag. t. 2698 (1826).

Ridges at North Fork of Hangman's Creek, Indian Reservation; July 1 (No. 529).

Gilia heterophylla Dougl.; Hook. Bot. Mag. t. 2895 (1829).

Woods at 1,200 meters altitude on Wiessner's Peak, Kootenai County; July 8 (No. 585).

Gilia liniflora pharnaceoides (Benth.) Gray, Proc. Amer. Acad. viii, 263 (1870); *Gilia pharnaceoides* Benth. Bot. Reg. sub t. 1622 (1833).

Dry soil, Viola, Latah County; June 23 (No. 490). Also near Farmington, Latah County, and Farmington Landing, Lake Cœur d'Alene in valley of Spokane River and near Rathdrum.

Navarretia intertexta Hook. Fl. Bor. Amer. ii, 75 (1838); *Gilia intertexta* Steud. Nom. i, 683 (1840).

Sandy soil, Farmington Landing, Lake Cœur d'Alene; July 12 (No. 624). Low grounds, Spokane, Washington; August 16 (No. 904).

Polemonium occidentale Greene, Pittonia, ii, 75 (1890).

Wiessner's Peak, Kootenai County; July 8 (No. 591).

Polemonium humile Willd.; Rœm. & Schult. Syst. iii, 792 (1819).

Wiessner's Peak, Kootenai County; July 8 (No. 1049).

Polemonium humile pulchellum (Bunge) Gray, Syn. Fl. ii, pt. i, 150 (1878); *P. pulchellum* Bunge, in Ledeb. Fl. Alt. i, 233 (1829).

In crevices of rocks at Granite Station, Kootenai County; July 29 (No. 791).

Polemonium micranthum Benth. in DC. Prodr. ix, 318 (1845).

Rocky grounds, valley of Hatwai Creek, Nez Perces County; April 28 (No. 61). Also valleys of Clearwater and Big Potlatch rivers, head of Little Potlatch River, and near Farmington, Latah County.

HYDROPHYLLACEÆ.

Hydrophyllum capitatum Dougl.; Benth. Linn. Trans. xvii, 273 (1837).

Rich soil, valley of Clearwater River, Nez Perces County; April 24 (No. 29). Also region of Lake Waha.

Hydrophyllum virginianum L. Sp. Pl. i, 146 (1753).

The first edition of Linnæus's Species spells this *virginianum*, not *virginicum*.

Moist places, valley of Peter Creek, Nez Perces County; May 4 (No. 112).

Phacelia magellanica (Lam.) Coville, Contr. Nat. Herb. iv, 159 (1893); *Hydrophyllum magellanicum* Lam. Journ. Hist. Nat. i, 373 (1787); *P. circinata* (Willd.) Jacq. f. Eclog. Amer. i, 135, t. 91 (1811).

Common on rocky hillsides and in sandy soil, valley of Hatwai Creek, Nez Perces County; May 14 (No. 174). Sandy soil, valley of Spokane River, Kootenai County; July 16 (No. 655). No. 174 is the form called *P. circinata stricta* Gray.

Phacelia linearis (Pursh); *Hydrophyllum lineare* Pursh, Fl. i, 134 (1814); *Eutoca menziesii* R. Br.; Richards. Bot. App. 764, t. 27, figs. 1–5 (1823).

Common on basaltic rocks, valley of Clearwater River, Nez Perces County; April 24 (No. 16).

BORAGINACEÆ.

Lappula lappula (L.) Karst. Deutsch. Flora, 979 (1880–83); *Myosotis lappula* L. Sp. Pl. i, 131 (1753); *Echinospermum lappula* Lehm. Pug. ii, 23 (1818).

Growing along railroad embankments, Spokane, Washington; August 19 (No. 928).

Lappula texana (Scheele) Britton, Mem. Torr. Club, v, 273 (1894); *Echinospermum texanum* Scheele, Linnæa, xxv, 260 (1852); *E. redowskii cupulatum* Gray, Bot. Cal. i, 530 (1876).

Common on sandy soil, valley of the Clearwater River, Nez Perces County; April 24 (No. 17).

Plagiobothrys tenellus (Nutt.) Gray, Proc. Amer. Acad. xx, 283 (1885); *Myosotis tenella* Nutt. Hook. Kew Journ. Bot. iii, 295 (1851).

Sandy soil, island in Clearwater River, near Upper Ferry, above Lewiston; May 2 (No. 87).

Cryptanthe flaccida (Dougl.) Greene, Pittonia, i, 115 (1887); *Myosotis flaccida* Dougl.; Lehm. Pug. pt. ii, 22 (1830); *Krynitzkia oxycarya* Gray, Proc. Amer. Acad. xx, 269 (1885).

Valley of Clearwater River, Nez Perces County; May 14 (No. 163). Also valley of Big Potlatch River.

Cryptanthe leiocarpa (Fisch. & Mey.) Greene, Pittonia, i, 117 (1887); *Echinospermum leiocarpum* Fisch. & Mey. Ind. Sem. Petrop. 36 (1835).

Very common on sandy soil, valley of Clearwater River, Nez Perces County; April 23 (No. 10). Common on sandy soil near Julietta, Latah County; June 8 (No. 351).

Cryptanthe pterocarya (Torr.) Greene, Pittonia, i, 120 (1887); *Krynitzkia pterocarya* Gray, Proc. Amer. Acad. xx, 276 (1885); *Eritrichium pterocaryum* Torr. Bot. Wilkes, 415, t. 13 (1854).

Common in dry soil, valley of Big Potlatch River, Nez Perces County; June 9 (No. 365).

Amsinckia intermedia Fisch. & Mey. Ind. Sem. Petrop. 26 (1835).

Common in the valley of Clearwater River, Nez Perces County; April 23 (No. 3).

Amsinckia lycopsoides Lehm; DC. Prodr. x, 117 (1846).

Common on basaltic rocks, valley of Clearwater River, Nez Perces County; April 23 (No. 20).

Mertensia oblongifolia (Nutt.) Don, Hist. Dichl. Pl. iv, 372 (1838); *Pulmonaria oblongifolia* Nutt. Journ. Acad. Phila. vii, 43 (1824).

Frequent on slopes, valley of Clearwater River, Nez Perces County; April 28 (No. 75).

Mertensia paniculata (Ait.) Don, Hist. Dichl. Pl. iv, 318 (1838); *Pulmonaria paniculata* Ait. Hort. Kew. i, 181 (1789).

Moist places at 1,050 meters altitude, Cedar Mountain, Latah County; June 17 (No. 420).

Myosotis verna Nutt. Gen. ii, Add. (1818).

Rocky banks, valley of Hatwai Creek, Nez Perces County; May 17 (No. 184). Also valley of Big Potlatch, and valley and head of Little Potlatch River.

Lithospermum pilosum Nutt. Journ. Acad. Phila. vii, 43 (1834).

Common in sandy soil, valley of Hatwai Creek, Nez Perces County; April 25 (No. 40). Grassy slopes, same locality; May 10 (No. 155).

CONVOLVULACEÆ.

Convolvulus sepium L. Sp. Pl. i, 153 (1753).

Along railroad embankments, valley of Lake Pend d'Oreille; August 23 (No. 944).

SOLANACEÆ.

Solanum nigrum L. Sp. Pl. i, 186 (1753).

Waste ground near Granite Station, Kootenai County; July 29 (No. 779).

Solanum triflorum Nutt. Gen. i, 128 (1818).

Sandy soil near Bonner, Missoula County, Montana; August 30 (No. 985).

Physalis lanceolata Mx. Fl. i, 149 (1803).

This plant is only in flower, and the determination is doubtful. It is more glabrous than the species to which it is here referred, and it branches from near the ground.

Along railroad tracks, Hope, north end of Lake Pend d'Oreille; August 26 (No. 969).

SCROPHULARIACEÆ.

Verbascum blattaria L. Sp. Pl. i, 178 (1753).

Bottom lands, valley of Cœur d'Alene River, Kootenai County; July 13 (No. 642). Sandy soil, Thompson Falls, Montana; August 26 (No. 971).

Verbascum thapsus L. Sp. Pl. i, 177 (1753).

Along roadsides, Spokane, Washington; August 17 (No. 918).

Scrophularia marilandica L. Sp. Pl. ii, 619 (1753); *Scrophularia nodosa marilandica* Gray, Syn. Fl. ii, pt. i, 258 (1878).

Common in shady places, valley of Hatwai Creek, Nez Perces County, May 24 (No. 250).

Pentstemon confertus Dougl. Bot. Reg. xv, t. 1260 (1829).

Frequent on rocky hillsides, Craig Mountains near Lake Waha, Nez Perces County; May 24 (No. 245). Frequent in dry soil, head of Little Potlatch River, Latah County; June 16 (No. 406). Thompson Falls, Montana; August 28 (No. 1030).

Pentstemon confertus procerus (Dougl.) Coville, Contr. Nat. Herb. iv, 169 (1893); *P. procerus* Dougl.; Graham, Edinb. N. Phil. Journ. vii, 348 (1829).

Moist places, Julietta, Latah County; June 8 (No. 341).

Pentstemon deustus Dougl. Bot. Reg. xvi, t. 1318 (1830).

Crevices of rocks, Post Falls, valley of Spokane River, Kootenai County; July 15 (No. 650).

Pentstemon ellipticus Coult. & Fish. Bot. Gaz. xviii, 302 (1893).

This plant has the leaves not quite entire, leaning in this respect toward *P. newberryi* Gray, Pacific R. Rep. vi, 82, t. 14 (1855–57), which has a more southerly range.

Rocks, summit of Wiessner's Peak, Kootenai County; July 8 (No. 603).

Pentstemon glandulosus Lindl. Bot. Reg. xv, t. 1262 (1829).

Rocky soil, valley of Hatwai Creek, Nez Perces County; May 14 (No. 169). Also vicinity of Lake Waha and valley of Big Potlatch River.

Pentstemon lyallii Gray, Syn. Fl. ii, pt. i, 440 (1878); *P. menziesii* var.? *lyallii* Gray, Proc. Amer. Acad. vi, 76 (1862).

On precipitous ledges of granite, south end of Lake Pend d'Oreille; July 27 (No. 757).

Pentstemon menziesii Hook. Fl. Bor. Amer. ii, 98 (1838).

In crevices of rocks, at 1,200 meters altitude, Bald Knob, Cedar Mountain, Latah County; June 20 (No. 466). Mountains at 1,200 meters altitude near Rathdrum, Kootenai County; July 20 (No. 673). Also near south end of Lake Pend d'Oreille.

Pentstemon rattani minor Gray, Proc. Amer. Acad. xv, 51(1879).

Sandy soil, island near Upper Ferry, Clearwater River, above Lewiston; May 10 (No. 151). Frequent in rocky places, valley of Hatwai Creek, Nez Perces County, May 14 (No. 172).

Pentstemon triphyllus Dougl. Bot. Reg. xv, t. 1245 (1829).

Frequent in dry soil, valley of Clearwater River, Nez Perces County; May 31 (No. 284).

Pentstemon venustus Dougl. Bot. Reg. xvi, t. 1309 (1830).

Rocky hillsides, valley of Big Potlatch River, Nez Perces County; June 4 (No. 307). Also valley of Big Potlatch and head of Little Potlatch River.

Collinsia grandiflora Dougl. Bot. Reg. xiii, t. 1107 (1827).

Basaltic rocks, valley of the Clearwater River, Nez Perces County; April (No. 7).

Collinsia parviflora Dougl. Bot. Reg. xiii, t. 1082 (1827).

Rich soil, valley of Hatwai Creek, Nez Perces County; April 24 (No. 38).

Mimulus moschatus Dougl.; Lindl. Bot. Reg. xiii, t. 1118 (1827).

Frequent in wet places, Julietta, Latah County; June 8 (No. 336). In like situations, Bald Knob, Cedar Mountain, Latah County; June 20 (No. 444).

Mimulus nasutus Greene, Bull. Cal. Acad. i, 112 (1885).

Common in springy places, valley of Hatwai Creek, Nez Perces County; April 28 (No. 66).

Mimulus pulsiferæ Gray, Proc. Amer. Acad. xi, 98 (1876).

Moist ground, Spokane, Washington; August 18 (No. 926).

Mimulus rubellus Gray, Bot. Mex. Bound. 116 (1859).

But this plant has pure yellow flowers and is also more tender.

Moist places, Julietta, Latah County; June 8 (No. 347).

Eunanus sp.

Slopes near foot of Wiessner's Peak, Kootenai County; July 8 (No. 586).

Eunanus nanus (Hook. & Arn.) nom. nov.; *Mimulus nanus* Hook. & Arn. Bot. Beech. 378 (1840).

Rocky places, at 900 meters altitude, Craig Mountains, near Laka Waha, Nez Perces County; May 24 (No. 241).

Gratiola ebracteata Benth. in DC. Prodr. x, 595 (1846).

Frequent on muddy shores, Cedar Mountain, Latah County; June 17 (No. 430).

Gratiola virginiana L. Sp. Pl. i, 17 (1753).

Frequent in muddy places, valley of the Big Potlatch River, Nez Perces County; June 9 (No. 368).

Synthyris reniformis (Dougl.) DC. Prodr. x, 454 (1846); *Wulfenia reniformis* Dougl.; Benth. Scroph. Ind. 46 (1835).

Shady, moist places, Craig Mountains near Lake Waha, Nez Perces County; May 20 (No. 200).

Synthyris rubra (Dougl.) DC. Prodr. x, 455 (1846); *Gymnandra rubra* Dougl.; Hook. Fl. Bor. Amer. ii, 103 (1838).

Common on grassy slopes, valley of Hatwai Creek, Nez Perces County; April 28 (No. 67).

Veronica americana Schwein.; Benth. in DC. Prodr. x, 468 (1846).

Common in wet places, valley of Hatwai Creek; May 27 (No. 254).

Veronica peregrina L. Sp. Pl. i, 14 (1753).

Common in wet places, valley of Hatwai Creek, Nez Perces County; May 27 (No. 255).

Veronica scutellata L. Sp. Pl. i, 12 (1753).

Meadows, head of Little Potlatch River, Latah County; June 18 (No. 431).

Veronica serpyllifolia L. Sp. Pl. i, 12 (1753).

On a grassy, wooded slope, valley of Lake Waha, Nez Perces County; May 22 (No. 236). Moist places, Julietta, Latah County; June 8 (No. 350).

Castilleja miniata Dougl.; Hook. Fl. Bor. Amer. ii, 106 (1838).

Frequent on grassy slopes, Cedar Mountain, Latah County; June 17 (No. 426).

Castilleja acuminata (Pursh) Spreng. Syst. ii, 775 (1825); *Bartsia acuminata* Pursh, Fl. i, 429 (1814); *C. septentrionalis* Lindl. Bot. Reg. t. 925 (1825); *C. pallida septentrionalis* Gray, Bot. Cal. i, 575 (1876).

Frequent on hillsides, head of Little Potlatch River, Latah County; June 20 (No. 450).

Castilleja parviflora Bong. Veg. Sitch. 158 (1831).

Rocky hillsides, on Hatwai Creek, Nez Perces County; April 30 (No. 76).

Orthocarpus luteus Nutt. Gen. ii, 57 (1818).

Sandy soil, valley of Big Potlatch River, Nez Perces County; June 6 (No. 318). Also valley and head of Little Potlatch River, and near Viola, Latah County.

Orthocarpus tenuifolius Benth. Scroph. Ind. 12 (1835).

Dry soil, near Bald Knob, Cedar Mountain, Latah County; June 20 (No. 455). Also near Viola and Farmington, Latah County, and in valley of Spokane River, Kootenai County.

Pedicularis bracteosa Benth.; Hook. Fl. Bor. Amer. ii, 110 (1838).

In canyons, near Farmington Landing, Lake Coeur d' Alene; July 6 (No. 1053).

Pedicularis contorta Benth.; Hook. Fl. Bor. Amer. ii, 108 (1838).

On mountain slopes, Wiessner's Peak, Kootenai County; July 8 (No. 592).

Pedicularis racemosa Dougl.; Hook. Fl. Bor. Amer. ii, 108 (1838).

Deep woods, Viola, Latah County; June 25 (No. 486). Also near Farmington, Latah County, and Farmington Landing, Kootenai County.

Melampyrum americanum Mx. Fl. ii, 16 (1803).

Woods, Granite Station, Kootenai County; July 30 (No. 808).

OROBANCHACEÆ.

Thalesia fasciculata (Nutt.) Britton, Mem. Torr. Club, v. 298 (1894); *Orobanche fasciculata* Nutt. Gen. ii, 59 (1818); *Aphyllon fasciculatum* Gray, Syn. Fl. ii, pt. 1 (1878).

Growing on Eriogonum.

Valley of Big Potlatch River, Nez Perces County; June 4 (No. 308).

Thalesia uniflora (L.) Britton, Mem. Torr. Club, v, 298 (1894); *Orobanche uniflora* L. Sp. Pl. ii, 633 (1753); *Aphyllon uniflorum* Torr. & Gr.; Gray, Man. 290 (1848).

Common on hillsides, valley of Clearwater River, Nez Perces County; April 23 (No. 11). Also vicinity of Lake Waha.

Orobanche pinetorum Geyer, Hook. Kew Journ. Bot. iii, 297 (1851); *Aphyllon pinetorum* Gray, Bot. Cal. i, 585 (1876).

But the anthers are fringed with scattered hairs, not "glabrous"

Growing on Abies, Wiessner's Peak, Kootenai County; July 11 (No. 623).

LENTIBULARIACEÆ.

Utricularia vulgaris L. Sp. Pl. i, 18 (1753).

Ponds, at Granite Station, Kootenai County; July 29 (No. (780).

VERBENACEÆ.

Verbena bracteosa Mx. Fl. ii, 13 (1803).

Frequent on rocky hillsides, valley of Clearwater River, Nez Perces County; May 30 (No. 264). Sandy soil, Thompson Falls, Montana; August 27 (No. 972).

LABIATÆ.

Mentha canadensis L. Sp. Pl. ii, 577 (1753); *M. borealis* Mx. Fl. ii, 2 (1803).

Moist places, valley of Mud Lake, Kootenai County; July 25 (No. 734). Valley of Lake Tesemini, Kootenai County; July 22 (No. 698).

Lycopus virginicus L. Sp. Pl. i, 21 (1753).

Moist places at Mud Lake, Kootenai County; July 25 (No. 727).

Micromeria douglasii (Benth.) Benth. Lab. 372 (1832-36); *Thymus douglasii* Benth. Linnæa, vi, 80 (1831).

Frequent in woods, Bald Knob, Cedar Mountain, Latah County; June 20, (No. 445).

Salvia carnosa Dougl. Bot. Reg. xvii, t. 1469 (1831); *Audibertia incana* Benth. loc. cit.

Spokane, Washington; August 17 (No. 1027).

Monarda fistulosa mollis (L.) Benth. Lab. 317 (1832-36); *M. mollis* L. Sp. Pl. ed. 2, i, 32 (1762).

Sandy shore, Lake Pend d'Oreille; August 1 (No. 817).

Vleckia urticifolia (Benth.) nom. nov.; *Lophanthus urticifolius* Benth. Bot. Reg. xv, sub t. 1282 (1829) and Lab. 462 (1832-36).

Rich bottoms, valley of Hatwai Creek, Nez Perces County; May 28 (No. 263). Also vicinity of Lake Waha, valley of Big Potlatch River, and near Viola and Farmington, Latah County.

Nepeta cataria L. Sp. Pl. ii, 570 (1753).

In waste places, Bonner, Missoula County, Montana; August 30 (No. 983).

Dracocephalum parviflorum Nutt. Gen. ii, 35 (1818).

Waste ground, Granite Station, Kootenai County; July 29 (No. 786).

Scutellaria angustifolia Pursh, Fl. ii, 412 (1814).

Common on hillsides, valley of Peter Creek, Nez Perces County; May 4 (No. 115).

Scutellaria galericulata L. Sp. Pl. ii, 599 (1753).

Creek bottoms, Wiessner's Peak, Kootenai County; July 8 (No. 598).

Scutellaria lateriflora L. Sp. Pl. ii, 598 (1753).

Wet places, valley of Cœur d'Alene River, Kootenai County; July 13 (No. 641).

Prunella vulgaris L. Sp. Pl. ii, 600 (1753).

Common in meadows, valley of the Big Potlatch River, Nez Perces County; June 9 (No. 366).

Physostegia parviflora Nutt.; Benth. in DC. Prodr. xii, 434 (1848), as synonym.

Alluvial soil, Lake View, Kootenai County; August 7 (No. 869).

Marrubium vulgare L. Sp. Pl. ii, 583 (1753).

Hillsides, Viola, Latah County; June 26 (No. 491).

Stachys palustris L. Sp. Pl. ii, 580 (1753).

Wet places, valley of Cœur d'Alene River, Kootenai County; July 13 (No. 639).

Trichostema oblongum Benth. Lab. 659 (1832–36).

Moist places, valley of Pine Creek, near Farmington, Latah County; June 28 (No. 511).

PLANTAGINACEÆ.

Plantago lanceolata L. Sp. Pl. i, 113 (1753).

Meadows, near Viola, Latah County; June 23 (No. 480).

Plantago purshii Rœm. & Schult. Syst. Veg. iii, 120 (1818); *P. gnaphaloides* Nutt. Gen. i, 100 (1818); *P. patagonica gnaphalioides* Gray, Man. ed. 2, 269 (1856). Common on sandy soil, valley of Clearwater River, Nez Perces County; May 30 (No. 267).

NYCTAGINACEÆ.

Abronia fragrans Nutt.; Hook. Kew Journ. Bot. v, 261 (1853).

From its fruit, though not quite mature, this plant seems to belong to the species named. It differs, however, from the typical form in its narrower leaves and more elongated peduncles. More abundant material and fully ripened fruit are needed entirely to establish this reference. The specimens do not agree with the description of *A. suksdorfii* by Coulter & Fisher,[1] of which, however, I have seen no typical examples.

Sandy soil, Colgate, near Glendive, Dawson County, Montana; September 6 (No. 1016).

AMARANTHACEÆ.

Amaranthus albus L. Sp. Pl. ed. 2, ii, 1404 (1764).

Waste places, near Hope, Kootenai County; August 25 (No. 962).

Amaranthus blitoides Wats. Proc. Amer. Acad. xii, 273 (1877).

Near Bonner, on Hellgate River, Missoula County, Montana; August 30 (No. 987).

Amaranthus californicus (Moq.) Wats. Bot. Cal. ii, 42 (1880); *Mengea californica* Moq. in DC. Prodr. xiii, pt. ii, 270 (1849).

Near Bonner, Missoula County, Montana; August 30 (No. 1044).

Amaranthus retroflexus L. Sp. Pl. ii, 991 (1753).

Except in the reddish tinge of stem and spikes, this plant agrees well with our specimens of *A. retroflexus*. But not one of our plants referred to this species agrees with the original Linnæan description "caule firmo, subvilloso, flexuoso a folio ad folium," i. e., the rigid stem zigzag. The lower branches also are described as "at first recurved, then ascending," apparently as in *A. albus*. The plant at present understood to be *A. retroflexus* thus appears not to be the Linnæan species.

Waste places, near Hope, Kootenai County; August 25 (No. 961).

CHENOPODIACEÆ.

Monolepis nuttalliana (Rœm. & Schult.) Greene, Fl. Fran. 168 (1891); *Blitum nuttallianum* Rœm. & Schult. Syst. Mant. i, 65 (1822); *Monolepis chenopodioides* Moq. in DC. Prodr. xiii, pt. 2, 85 (1849); *Blitum chenopodioides* Nutt. Gen. i, 4 (1818), not Lam.

On shady rocks, valley of Clearwater River, Nez Perces County; May 17 (No. 192). Also valleys of Big Potlatch and Little Potlatch Rivers.

[1] Bot. Gaz. xvii, 348 (1892).

Chenopodium album L. Sp. Pl. i, 219 (1753).

Waste ground, near Lake Tesemini, Kootenai County; July 21 (No. 695).

Chenopodium botrys L. Sp. Pl. i, 219 (1753).

Railroad embankments near Granite Station; July 29 (No. 775).

Atriplex patula L. Sp. Pl. ii, 1053 (1753).

Sandy soil, plains at Colgate, near Glendive, Montana; September 6 (No. 1018).

Corispermum hyssopifolium L. Sp. Pl. i, 4 (1753).

Sandy soil, near Glendive, Montana; September 6 (No. 1013).

Suæda depressa (Pursh) Wats. Bot. King Surv. 294 (1871); *Salsola depressa* Pursh, Fl. i, 197 (1814).

On buttes, Colgate, near Glendive, Dawson County, Montana; September 6 (No. 1034).

POLYGONACEÆ.

Eriogonum annuum Nutt. Trans. Amer. Phil. Soc. v, 164 (1837).

On buttes, Colgate, near Glendive, Dawson County, Montana; September 4 (No. 996).

Eriogonum cernuum Nutt. Journ. Acad. Phila. n. ser. i, 162 (1847).

Sandy soil, Colgate, near Glendive, Dawson County, Montana; September 5 (No. 1002).

Eriogonum compositum Dougl.; Benth. Trans. Linn. Soc. xvii, 410, t. 17, f. 10 (1837).

Rocky soil, valley of Clearwater River, Nez Perces County; May 30 (No. 269). Also vicinity of Lake Waha, valley of Little Potlatch River, and near Viola and Farmington, Latah County.

Eriogonum flavum Nutt.; Benth. in DC. Prodr. xiv, 8 (1856).

In exposed crevices, Packsaddle Peak, Kootenai County; August 6 (No. 854).

Eriogonum heracleoides Nutt. Journ. Acad. Phila. vii, 49 (1834).

Frequent in sandy soil, valley of Big Potlatch River, Nez Perces County; June 4 (No. 306).

Eriogonum multiceps Nees, in Pr. Neuwied, Reise Nord. Amer. ii, 446 (1841).

On buttes at Colgate, near Glendive, Dawson County, Montana; September 4 (No. 997).

Eriogonum niveum Dougl.; Benth. Trans. Linn. Soc. xvii, 414 (1837).

On basaltic formations, Spokane, Washington; August 16 (No. 903).

Eriogonum ovalifolium Nutt. Journ. Acad. Phila. vii, 50 (1834).

On precipitous ledges of granite, valley of Lake Pend d'Oreille; July 27 (No. 747).

Eriogonum umbellatum Torr. Ann. Lyc. N. Y. ii, 241 (1828).

Mountains, at 1,200 meters altitude, near Rathdrum, Kootenai County; July 20 (No. 677).

Polygonum alpinum All. Fl. Ped. ii, 206, t. 68, f. i (1785); *P. polymorphum* Ledeb. Fl. Ross. iii, 524 (1849).

Wiessner's Peak, Kootenai County; July 8 (No. 662).

Polygonum amphibium L. Sp. Pl. i, 361 (1753).

Ponds, valley of Lake Tesemini, Kootenai County; July 21 (No. 689). Wet shores, near Rathdrum, Kootenai County; July 23 (No. 711).

Polygonum aviculare L. Sp. Pl. i, 362 (1753).

Waste grounds, valley of Lake Pend d'Oreille, Kootenai County; August 26 (No. 966).

Polygonum bistortoides Pursh, Fl. i, 217 (1814).

Meadows, valley of Little Potlatch River, Latah County; June 16 (No. 400).

Polygonum convolvulus L. Sp. Pl. i, 364 (1753).

Common on waste grounds, valley of Clearwater River, Nez Perces County; June 2 (No. 287).

Polygonum douglasii Greene, Bull. Cal. Acad. iii, 125 (1885).

Very common in dry soil, valley of Clearwater River, Nez Perces County; May 30 (No. 271). At 1,200 meters altitude, Bald Knob, Cedar Mountain, Latah County; June 20 (No. 474). Sandy soil, valley of Lake Pend d'Oreille; August 26 (No. 968).

Polygonum hartwrightii Gray, Proc. Amer. Acad. viii, 294 (1870).

Near Granite Station, Kootenai County; July 30 (No. 807).

Polygonum imbricatum Wats. Amer. Nat. vii, 665 (1873).

Frequent in dry soil, valley of Little Potlatch River, Latah County; June 16 (No. 411).

Polygonum lapathifolium L. Sp. Pl. i, 360 (1753).

Moist places, valley of Mud Lake, Kootenai County; July 25 (No. 736).

Polygonum minimum Wats. Bot. King Surv. v, 315 (1871).

Exposed rocky slope at 2,550 meters altitude, Packsaddle Peak, Kootenai County; August 6 (No. 851).

Polygonum pennsylvanicum L. Sp. Pl. i, 362 (1753).

Wet places at north end of Lake Pend d'Oreille; August 25 (No. 960).

Oxyria digyna (L.) Hill, Veg. Syst. x, 24 (1765); *Rumex digynus* L. Sp. Pl. i, 337 (1753).

Crevices of rocks near summit of Packsaddle Peak, Kootenai County; August 5 (No. 833).

Rumex acetosella L. Sp. Pl. i, 338 (1753).

Common on sandy soil, valley of Clearwater River, Nez Perces County; May 9 (No. 148).

Rumex maritimus L. Sp. Pl. i, 335 (1753).

Wet places, near Granite Station, Kootenai County; July 29 (No. 778).

Rumex occidentalis Wats. Proc. Amer. Acad. xii, 253 (1877).

Common in wet copses, valley of the Big Potlatch River, Nez Perces County; June 9 (No. 364). Along creeks near Rathdrum, Kootenai County; July 25 (No. 720).

Rumex salicifolius Weinm. Flora, iv, 28 (1821).

Common on river banks, valley of Clearwater River, Nez Perces County; May 10 (No. 152). At Hope, Kootenai County; August 26 (No. 1025).

Rumex venosus Pursh, Fl. ii, 733 (1814).

Rocky hillsides, valley of Clearwater River, Nez Perces County; April 26 (No. 50). Also valley of Big Potlatch River.

ARISTOLOCHIACEÆ.

Asarum caudatum Lindl. Bot. Reg. xvii, sub t. 1399 (1831). See also DC. Prodr. xv, pt. i, 424, under *A. hookeri majus* (1864).

Frequent in shady canyons, at 1,100 meters altitude, Bald Knob, Cedar Mountain, Latah County; June 20 (No. 456).

ELEAGNACEÆ.

Lepargyræa argentea (Pursh) Greene, Pittonia, ii, 122 (1890); *Hippophaë argentea* Pursh, Fl. i, 115 (1814).

On buttes, Colgate, near Glendive, Dawson County, Montana; September 6 (No. 1019).

Lepargyræa canadensis (L.) Greene, Pittonia, ii, 122 (1890); *Hippophaë canadensis* L. Sp. Pl. ii, 1024 (1753); *Shepherdia canadensis* Nutt. Gen. ii, 241 (1818).

Copses, near Lake View, Kootenai County; August 5 (No. 870).

LORANTHACEÆ.

Razoumofskya americana (Engelm.) Kuntze, Rev. Gen. Pl. ii, 587 (1891); *Arceuthobium americanum* Engelm.; Gray, Pl. Lindh. ii, 214 (1850).

On *Pinus contorta*.

Near Rathdrum, Kootenai County; August 12 (No. 892).

Razoumofskya douglasii (Engelm.) Kuntze, Rev. Gen. Pl. ii, 587 (1891); *Arceuthobium douglasii* Engelm. Bot. Wheeler Surv. vi, 253 (1878).

On *Pseudotsuga mucronata*.

At the south end of Lake Pend d'Oreille; July 27 (No. 744).

Razoumofskya occidentalis (Engelm.) Kuntze, Rev. Gen. Pl. ii, 587 (1891); *Arceuthobium occidentale* Engelm. Bot. Wheeler Surv. 254 (1878).

On *Pinus ponderosa*.

Near Spokane, Washington; August 18 (No. 925).

Razoumofskya sp. An inch or two high; branching; stems and branches brownish, the latter with the flowers inclined to yellow.

On *Larix occidentalis*.

Granite Station, Kootenai County; July 29 (No. 787).

SANTALACEÆ.

Comandra pallida DC. Prodr. xiv, 636 (1857).

Kamyak Butte, near Viola, Latah County; June 26 (No. 499).

EUPHORBIACEÆ.

Euphorbia dictyosperma Fisch. & Mey. Ind. Sem. Hort. Petrop. ii, 37 (1835).

Bottom lands, valley of Hatwai Creek, Nez Perces County; May 27 (No. 256).

Also vicinity of Lake Waha, and valley of Big Potlatch River.

Euphorbia serpyllifolia Pers. Syn. Pl. ii, 14 (1807).

Sandy soil, near Spokane Bridge, Washington; August 15 (No. 898).

URTICACEÆ.

Celtis occidentalis pumila (Pursh) Gray, Man. ed. 2, 397 (1856); *C. pumila* Pursh, Fl. 200 (1814).

A low, straggling bush, which does not leaf out till May.

Valley of Clearwater River, Nez Perces County; May 2 (No. 85).

Urtica gracilis Ait. Hort. Kew. iii, 341 (1789). See also DC. Prodr. xvi, pt. i, 52 (1869), synonyms under *U. dioica angustifolia*.

Moist places, common, on Little Potlatch River, Latah County; June (No. 376).

Urtica lyallii Wats. Proc. Amer. Acad. x, 348 (1875).

Moist places, Packsaddle Peak, Kootenai County; August 6 (No. 864).

Parietaria pennsylvanica Muhl.; Willd. Sp. Pl. iv, 955 (1805).

Moist places, valley of Clearwater River, Nez Perces County; May 14 (No. 176).

CUPULIFERÆ.

Betula occidentalis Hook. Fl. Bor. Amer. ii, 155 (1838).

Common along streams, valley of Hatwai Creek, Nez Perces County; April 24 (No. 33). Woods, valley of Pine Creek, near Farmington, Latah County; June 26 (No. 513). Copses at Hope, Kootenai County; August 26 (No. 1024).

Betula pumila L. Mant. 124 (1767).

Marshes, Granite Station, Kootenai County; July 29 (No. 796).

Alnus incana virescens Wats. Bot. Cal. ii, 81 (1880).

Frequent in shady woods, Cedar Mountain, Latah County; June 17 (No. 427); June 20 (No. 464).

Alnus serrulata (Ait.) Willd. Sp. Pl. iv, 336 (1805); *Betula serrulata* Ait. Hort. Kew. iii, 338 (1789).

Common on sand flats, Lapwai Agency, Nez Perces County; May 5 (No. 133).

SALICACEÆ.[1]

Salix cordata Muhl. Neue Schrift. Gesell. Naturf. Freunde Berlin, iv, 236 (1803).

Common along streams, valley of Hatwai Creek, Nez Perces County; April 24 (No. 39); April 28 (No. 70). Bottom lands, valley of Clearwater River, Nez Perces County; May 2 (No. 96). On Peter Creek, Nez Perces County; May 4, (No. 117). Canyons, valley of Lake Waha, Nez Perces County; May 21 (No. 215).

Salix flavescens scouleriana (Barratt) Bebb, nom. nov.; *S. scouleriana* Barratt; Hook. Fl. Bor. Amer. ii, 145 (1838).

Woods, valley of Lake Waha, Nez Perces County; May 27 (No. 237).

Salix lasiandra Benth. Pl. Hartw. 335 (1857).

Banks of Hatwai Creek, Nez Perces County; April 28 (No. 69). River banks, Lapwai Agency, Nez Perces County; May 5 (No. 129).

Salix lasiandra lancifolia (Andersson) Bebb, in Bot. Cal. ii, 84 (1880); *Salix lancifolia* Andersson, Monogr. Sal. 34 (1863).

River banks at Thompson Falls, Montana; August 28 (No. 1045).

Salix lasiolepis Benth. Pl. Hartw. 335 (1857).

Common on banks of streams, valley of Hatwai Creek, Nez Perces County; April 28 (No. 71).

Salix longifolia Muhl. Neue Schrift. Gesell. Naturf. Freunde Berlin, iv, 238 (1803).

Common on banks of Hatwai Creek, Nez Perces County; April 30 (No. 80). Copses, Thompson Falls, Montana; August 27 (No. 978).

Salix rostrata Richards. Bot. App. 753 (1823).

Frequent on banks of Peter Creek, Nez Perces County; May 4 (No. 118).

Populus trichocarpa Torr. & Gr.; Hook. Ic. Pl. ix, 878 (1852).

Common along streams, valley of Clearwater River, Nez Perces County; April 28 (No. 56).

ORCHIDACEÆ.

Calypso bulbosa (L.) Oakes, Cat. Verm. Pl. 28 (1842); *Cypripedium bulbosum* L. Sp. Pl. ii, 951 (1753); *Calypso borealis* Salisb. Parad. Lond. t. 89 (1807).

The beard on the lip of the eastern form is yellow, but it is white on this western plant. The latter may therefore be designated as *forma occidentalis*.

Deep canyons, Craig Mountains at Lake Waha, Nez Perces County; May 21 (No. 211). Also valley of Clearwater River, Nez Perces County, and near south end of Lake Pend d'Oreille.

Corallorhiza corallorhiza (L.) Karst. Deutsch. Fl. 448 (1880–83); *Ophrys corallorhiza* L. Sp. Pl. ii, 945 (1753); *Corallorhiza innata* R. Br.; Ait. Hort. Kew. ed. 2, v, 209 (1813).

In deep woods, scarce, Viola, Latah County; June 23 (No. 485).

Corallorhiza multiflora Nutt. Journ. Acad. Phila. iii, 138, t. 7 (1823).

In deep canyons, Farmington Landing, Lake Cœur d'Alene; July 5 (No. 552).

Corallorhiza striata Lindl. Gen. & Sp. Orchid. 534 (1840).

Frequent in canyons, Bald Knob, Cedar Mountain, Latah County; June 20 (No. 460).

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[1] The Willows were determined by Mr. M. S. Bebb, Rockford, Ill.

Listera convallarioides (Swartz) Torr. Comp. 320 (1826); *Epipactis convallarioides* Swartz, Kongl. Vet. Akad. Handl. Stockh. ser. 2, xxi, 232 (1800); *Listera convallarioides* Nutt. Gen. ii, 191 (1818), *nomen nudum*, without description or cross-reference to Swartz's plant.

Canyons, Bald Knob, Cedar Mountain, Latah County; June 20 (No. 458). Also head of Little Potlatch River; near Viola and Farmington, Latah County; and near Lake Pend d'Oreille.

Listera cordata (L.) R. Br.; Ait. Hort. Kew. ed. 2, v, 201 (1813); *Ophrys cordata* L. Sp. Pl. ii, 946 (1753).

Moist woods, valley of Traille River, Kootenai County; August 8 (No. 875).

Gyrostachys romanzoffiana (Cham.) MacMillan, Metasp. Minn. Val. 171 (1892); *Spiranthes romanzoffiana* Cham. Linnæa, iii, 32 (1828).

Wet places, Granite Station, Kootenai County; July 30 (No. 797).

Peramium menziesii (Lindl.) Morong, Mem. Torr. Club, v, 124 (1894); *Goodyera menziesii* Lindl. Gen. & Sp. Orchid. 492 (1840).

Woods, valley of Lake Tesemini, Kootenai County; July 21 (No. 679).

Cephalanthera oregana Reichenb. f. Linnæa, xli, 53 (1877).

Wooded mountain slopes, near Rathdrum, Kootenai County; July 20 (No. 676).

Epipactis gigantea Dougl.; Hook. Fl. Bor. Amer. ii, 202 (1840).

Near springs, north end of Lake Pend d'Oreille; August 26 (No. 970).

Habenaria dilatata (Pursh) Hook. Exot. Fl. ii, t. 95 (1825); *Orchis dilatata* Pursh, Fl. ii, 588 (1814).

Frequent in rich canyons, valley of Clearwater River, Nez Perces County; June 2 (No. 288).

Habenaria elegans (Lindl.) Boland. Cat. 29 (1870); *Platanthera elegans* Lindl. Gen. & Sp. Orchid. 285 (1826).

Woods on the St. Joseph River, Wiessner's Peak, at 1,800 meters altitude, Kootenai County; July 7 (No. 584).

Habenaria gracilis (Lindl.) Wats. Bot. Cal. ii, 135 (1880); *Platanthera gracilis* Lindl. Gen. & Sp. Orchid. 288 (1826).

Frequent in canyons, Bald Knob, Cedar Mountain, Latah County; June 20 (No. 471). Moist places, Packsaddle Peak, Kootenai County, August 6 (No. 861).

Habenaria orbiculata (Pursh) Torr. Compend. 318 (1826); *Orchis orbiculata* Pursh, Fl. ii, 588 (1814).

Rich woods, near south end of Lake Pend d'Oreille, July 28 (No. 767).

Habenaria unalascensis (Spreng.) Wats. Proc. Amer. Acad. xii, 277 (1877); *Spiranthes unalascensis* Spreng. Syst. iii, 708 (1826).

Meadows, near Viola, Latah County; June 26 (No. 1039).

Cypripedium montanum Dougl.; Lindl. Gen. & Sp. Orchid. 528 (1840).

Rich shady grounds, valley of Little Potlatch River, Latah County; June 13 (No. 384).

IRIDACEÆ.

Iris missouriensis Nutt. Journ. Acad. Phila. vii, 58 (1834).

Frequent in wet places, valley of the Big Potlatch River, Nez Perces County; June 6 (No. 315).

Sisyrinchium grandiflorum Dougl.; Lindl. Bot. Reg. xvi, t. 1364 (1830).

Common on table lands; island in Clearwater River, near Upper Ferry, above Lewiston, Nez Perces County; May 2 (No. 100).

Sisyrinchium bermudiana L. Sp. Pl. ii, 954 (1753); *S. mucronatum* Mx. Fl. ii, 33 (1803).

Moist ground, valley of Big Potlatch River, Nez Perces County; June 6 (No. 317).

LILIACEÆ.

Streptopus amplexifolius (L.) DC.; Lam. & DC. Fl. Franc. iii, 174 (1805); *Uvularia amplexifolia* L. Sp. Pl. i, 304 (1753).

Frequent in canyons, Bald Knob, Cedar Mountain, Latah County; June 20 (No. 470).

Vagnera amplexicaulis (Nutt.) Greene, Bot. San Fr. Bay, 316 (1894); *Smilacina amplexicaulis* Nutt. Journ. Acad. Phila. vii, 58 (1834).

Frequent on hillsides, vicinity of Lake Waha, Nez Perces County; May 22 (No. 228).

Vagnera sessilifolia (Nutt.) Greene, Bot. San Fr. Bay, 316 (1894); *Smilacina sessilifolia* Nutt.; Wats. Proc. Amer. Acad. xiv, 245 (1879); *Tovaria sessilifolia* Baker, Journ. Linn. Soc. xiv, 566 (1875).

Frequent in rich, shady soil, island in Clearwater River, near Upper Ferry, above Lewiston, Nez Perces County; May 2 (No. 89).

Brodiæa douglasii Wats. Proc. Amer. Acad. xiv, 237 (1879).

Common on hillsides and in bottoms, valley of Hatwai Creek, Nez Perces County; April 24 (No. 30).

Brodiæa lactea (Lindl.) Wats. Proc. Amer. Acad. xiv, 238 (1879); *Hesperoscordum lacteum* Lindl. Bot. Reg. xix, t. 1639 (1833); *Allium lacteum* Benth. Pl. Hartw. 339 (1839).

Wet places, valley of Pine Creek, near Farmington, Latah County; June 28 (No. 510).

Allium acuminatum Hook. Fl. Bor. Amer. ii, 184, t. 146 (1840).

Rocky hillsides, valley of Hatwai Creek, Nez Perces County; May 27 (No. 258). Also valley of lower Clearwater River.

Allium attenuifolium Kellogg, Proc. Cal. Acad. ii, 110, f. 34 (1863).

Shores, valley of Lake Pend d'Oreille; July 27 (No. 745).

Allium cusickii Wats. Proc. Amer. Acad. xiv, 228 (1879).

On all basaltic outcroppings, valley of Clearwater River, Nez Perces County; April 23 (No. 1).

Allium geyeri Wats. Proc. Amer. Acad. xiv, 227 (1879).

Rocky river bottoms, valley of Clearwater River, Nez Perces County; May 16 (No. 177).

Allium schœnoprasum L. Sp. Pl. i, 301 (1753).

Lake shores, Hope, Kootenai County; August 26 (No. 1023).

Allium serratum Wats. Bot. King Surv. 487 (1871).

But the scapes are taller in this plant and the stamens are fully as long as or even longer than the acuminate petals.

Rocky hillsides, scarce, valley of Big Potlatch River, Nez Perces County; June 9 (No. 355).

Camassia esculenta (Ker) Lindl. Bot. Reg. xviii, t. 1486 (1832); *Scilla esculenta* Ker, Bot. Mag. t. 1574 (1813).

Meadows near Lapwai Agency, Nez Perces County; April 20 (No. 132).

Lilium parviflorum (Hook.) nom. nov.; *L. canadense parviflorum* Hook. Fl. Bor. Amer. ii, 181 (1840); *Lilium columbianum* Hanson; Baker, Journ. Linn. Soc. xiv, 243 (1875).

This is the variety γ, to which alone of the three varieties named Hooker refers when he says "My NW. American specimens have much smaller flowers, of a redder hue, and are more disposed to be revolute." According to Watson[1] this is the same as *L. columbianum* Hanson.

Woods at the south end of Lake Pend d'Oreille; July 7 (No. 743).

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[1] Proc. Amer. Acad. xiv, 257 (1879).

Fritillaria lanceolata Pursh, Fl. i, 230 (1814), excl. syn.

Along streams, valley of Pine Creek, Farmington, Latah County; June 28 (No. 517).

Fritillaria pudica (Pursh) Spreng. Syst. ii, 64 (1825); *Lilium (?) pudicum* Pursh, Fl. i, 228, t. 8 (1814).

In No. 13, collected in April, the flowers are very strongly marked with pink; the anthers are white; the style of the well-formed pistil projects beyond the perianth. In No. 220, collected a month later at a higher altitude, the flowers are predominately yellowish, with only traces of pink; the anthers are yellow; the style does not reach half the length of the perianth parts, and the entire pistil is frequently absent by abortion. It seems from these data that the flowers of this species in earlier forms and lower altitudes are apt to be proterogynous; while in later, higher altitude forms they are proterandrous.

Common on hillsides throughout the valley of Clearwater River, Nez Perces County; April 23 (No. 13): already in fruit. Frequent on hillsides, valley of Lake Waha, Nez Perces County; May 21 (No. 220).

Erythronium grandiflorum Pursh, Fl. i, 231 (1814).

Common on Craig Mountains, vicinity of Lake Waha, Nez Perces County; May 20 (No. 202)

Calochortus elegans Pursh, Fl. i, 240 (1814). See also Dougl. Hort. Trans. vii, 278 (1830).

Frequent on hillsides, region of Lake Waha, Nez Perces County; May 20 (No. 196). Shady places near Julietta, Latah County; June 8 (No. 344). Rich woods near Farmington Landing, Lake Cœur d'Alene; July 2 (No. 532). Slopes on Wiessner's Peak, Kootenai County; July 8 (No. 604).

Calochortus macrocarpus Dougl. Hort. Trans. vii, 276, t. 8 (1830).

Valley of the Spokane River, near Post Falls, Kootenai County; July 17 (No. 660).

Xerophyllum tenax (Pursh) Nutt. Gen. i, 235 (1818); *Helonias tenax* Pursh, Fl. i, 243 (1814).

Grassy slopes near summit of Wiessner's Peak, Kootenai County; July 8 (No. 588).

Disporum majus (Hook.) Britton, Bull. Torr. Club, xv, 188 (1888); *Prosartes lanuginosa major* Hook. Fl. Bor. Amer. ii, 174 (1840).

With *Disporum trachycarpum*.

Canyons, Craig Mountains, near Lake Waha, Nez Perces County; May 20 (No. 198).

Disporum trachycarpum (Wats.) Benth. & Hook. Gen. Pl. iii, 832 (1883); *Prosartes trachycarpa* Wats. Bot. King Surv. v, 344 (1871).

Frequent in canyons, Craig Mountains, at 900 meters altitude, Lake Waha, Nez Perces County; May 20 (No. 1038).

Clintonia uniflora (Menzies) Kunth, Enum. v, 159 (1850); *Convallaria borealis uniflora* Menzies; Rœm. & Schult. Syst. Veg. vii, 307 (1828).

There is a first brief description of this plant without name, under *Smilacina borealis* Ker, sub nom. Gawler, Bot. Mag. xxxiv, t. 1403 (1811).

Woods, frequent, Cedar Mountain, Latah County; June 17 (No. 425).

Trillium ovatum Pursh, Fl. i, 245 (1814).

Frequent in rich woods, valley of Lake Waha, Nez Perces County; May 20 (No. 209).

Trillium petiolatum Pursh, Fl. i, 244 (1814).

Rich soil, valley of Hatwai Creek, Nez Perces County; April 24 (No. 27). Also vicinity of Lake Waha, and valley and head of Little Potlatch River.

Veratrum californicum Durand, Journ. Acad. Phila. ser. 2, iii, 103 (1855–58).

South end of Lake Pend d'Oreille; July 27 (No. 741).

Veratrum viride Ait. Hort. Kew. iii, 422 (1789).

Michaux[1] considered this the same as the European *Veratrum album* L.[2]

Moist places on Packsaddle Peak, Kootenai County; August 6 (No. 863).

Stenanthium occidentale Gray, Proc. Amer. Acad. viii, 405 (1872).

Precipitous ledges of granite, south end of Lake Pend d'Oreille; July 27 (No. 756).

Zygadenus venenosus Wats. Proc. Amer. Acad. xiv, 279 (1879).

Rocky hillsides on Peter Creek, Nez Perces County; May 4 (No. 114). Frequent on low ground along Big Potlatch River, Nez Perces County; June 6 (No. 319).

JUNCACEÆ.[3]

Juncus alpinus insignis Fries; Engelm. Trans. St. Louis Acad. ii, 459 (1868).

Wet shores of Lake Pend d'Oreille, at Hope, Kootenai County; August 24 (No. 950).

Juncus balticus Willd. Berlin Mag. iii, 298 (1809).

Frequent in wet places, at the head of Little Potlatch River, Latah County; June 18 (No. 436). Springy places at Hope, valley of Lake Pend d'Oreille, Kootenai County; August 24 (No. 951).

Juncus bufonius L. Sp. Pl. i, 328 (1753).

Common in wet places, valley of Big Potlatch River, Nez Perces County; June 4 (No. 312).

Juncus filiformis L. Sp. Pl. i, 326 (1753).

Shores, valley of Lake Tesemini, Kootenai County; July 21 (No. 692). Wet mountain meadows, valley of Traille River, Kootenai County; August 9 (No. 880).

Juncus nevadensis Wats. Proc. Amer. Acad. xiv, 303 (1879).

Nos. 261, 684, and 949 are only provisionally referred here.

Frequent in wet places, valley of Hatwai Creek, Nez Perces County; May 27 (No. 261). Valley of Little Potlatch River, Latah County; June 16 (No. 405). Head of Little Potlatch River, June 20 (No. 457). Valley of Lake Tesemini, Kootenai County; July 21 (No. 684). Valley of Lake Pend d'Oreille; August 24 (No. 949).

Juncus nodosus L. Sp. Pl. ed. 2, i, 466 (1762).

Wet places, Granite Station, Kootenai County; July 29 (No. 776).

Juncus parryi Engelm. Trans. St. Louis Acad. ii, 447 (1866).

Near summit of Wiessner's Peak, Kootenai County; July 8 (No. 593).

Juncus tenuis Willd. Sp. Pl. ii, 214 (1799).

Frequent in moist places on Little Potlatch River, Nez Perces County; June 13 (No. 379).

Juncus xiphioides triandrus Engelm. Trans. St. Louis Acad. ii, 482 (1868).

Frequent in wet places on Little Potlatch River, Nez Perces County; June 7 (No. 330).

Juncoides campestre (L.) Kuntze, Rev. Gen. Pl. ii, 722 (1891); *Juncus campestris* L. Sp. Pl. i, 329 (1753); *Luzula campestris* DC. Fl. Fr. iii, 161 (1805).

Common in woods about Lake Waha, Nez Perces County; May 22 (No. 230).

Juncoides glabratum (Hoppe) Sheldon, Bull. Geol. Hist. Minn. ix, 63 (1894); *Juncus glabratus* Hoppe; Rostk. Monogr. Junc. 27 (1801).

Wiessner's Peak, Kootenai County; July 8 (No. 613).

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[1] Fl. ii, 249 (1803).
[2] Sp. Pl. ii, 1044 (1753).
[3] The Juncaceæ were determined by Mr. Frederick V. Coville.

Juncoides parviflorum (Ehrh.) Coville, Contr. Nat. Herb. iv, 209 (1893); *Juncus parviflorus* Ehrh. Beitr. vi, 139 (1791); *Luzula spadicea parviflora* E. Meyer, Linnæa, xxii, 402 (1849).

Deep woods at Farmington Landing, Lake Cœur d'Alene, Kootenai County; July 5 (No. 554).

TYPHACEÆ.

Typha latifolia L. Sp. Pl. ii, 971 (1753).

Wet places, valley of Mud Lake, Kootenai County; July 25 (No. 739).

Sparganium simplex Hudson, Fl. Ang. ed. 2, 401 (1788).

Along creeks, near Rathdrum, Kootenai County; July 25 (No. 715).

Sparganium simplex angustifolium (Mx.) Engelm. in Gray Man. ed. 5, 481 (1867); *S. angustifolium* Mx. Fl. ii, 189 (1803).

Leaves floating.

Subalpine lakes, valley of Lake Tesemini, Kootenai County; July 22 (No. 700).

ARACEÆ.

Lysichiton kamtschatcensis (L.) Schott, Gen. Aroid. t. 91 (1858); Prodr. Aroid. 421 (1860); *Dracontium kamtschatcense* L. Sp. Pl. ed. 2, ii, 1372 (1763).

Cool, springy ground, near Rathdrum, Kootenai County; July 25 (No. 722).

LEMNACEÆ.

Lemna minor L. Sp. Pl. ii, 970 (1753).

Ponds, Granite Station, Kootenai County; July 30 (No. 801).

ALISMACEÆ.

Alisma plantago L. Sp. Pl. i, 342 (1753).

Wet places, Hope, Kootenai County; August 20 (No. 935).

Sagittaria latifolia Willd. Sp. Pl. iv, 409 (1806).

Wet places near Hope, Kootenai County; August 21 (No. 941).

NAIADACEÆ.

Triglochin maritima L. Sp. Pl. i, 339 (1753).

Wet shores, near Hope, Kootenai County; August 23 (No. 946).

Triglochin palustris L. Sp. Pl. i, 338 (1753).

Marshes, Granite Station, Kootenai County; July 29 (No. 790).

Potamogeton heterophyllus longipedunculatus (Merat) Morong, Mem. Torr. Club, iii, 24 (1893); *P. longipedunculatus* Merat, Fl. Paris (1812).

Shallow water, margin of Lake Pend d'Oreille, near Hope; August 24 (No. 955). Same vicinity; August 26 (No. 1026).

Potamogeton natans L. Sp. Pl. i, 126 (1753).

Shallow places, margin of Lake Pend d'Oreille, near Hope; August 20 (No. 939).

Potamogeton pectinatus L. Sp. Pl. i, 127 (1753).

Shallow water, margin of Lake Pend d'Oreille, near Hope; August 5 (No. 954).

Potamogeton perfoliatus richardsonii A. Bennett, Britten's Journ. Bot. xxvii, 25 (1889).

Shallow water, margin of Lake Pend d'Oreille, near Hope; August 25 (No. 956).

Potamogeton pulcher Tuckerm. Amer. Journ. Sci. ser. i, xlv, 38 (1843).

Subalpine lakes, at 900 meters altitude, valley of Lake Tesemini, Kootenai County; July 22 (No. 697).

CYPERACEÆ.[1]

Cyperus aristatus Rottb. Descr. et Icon. 23 (1773).

Moist places, near Rathdrum, Kootenai County; July 25 (No. 719).

Cyperus houghtonii Torr. Ann. Lyc. N. Y. iii, 277 (1836). See also Bull. Torr. Club, xviii, 368, 369 (1891).

Sandy soil, valley of Clearwater River, Nez Perces County; June 2 (No. 292).

Dulichium arundinaceum (L.) Britton, Bull. Torr. Club, xxi, 29 (1894); *Cyperus arundinacea* L. Sp. Pl. i, 44 (1753); *Schœnus spathaceus* L. Sp. Pl. ed. 2, i, 63 (1762); *Dulichium spathaceum* Pers. Syn. i, 65 (1805).

Wet places, near Granite Station, Kootenai County; July 29 (No. 777).

Eleocharis acicularis (L.) Rœm. & Schult. Syst. Veg. ii, 154 (1817); *Scirpus acicularis* L. Sp. Pl. i, 48 (1753).

Common in wet places, Viola, Latah County; June 23 (No. 484).

Eleocharis ovata (Roth) Rœm. & Schult. Syst. Veg. ii, 152 (1817); *Scirpus ovatus* Roth, Cat. i, 5 (1797).

Muddy places, valley of Cœur d'Alene River, Kootenai County; July 14 (No. 649).

Eleocharis palustris (L.) Rœm. & Schult. Syst. Veg. ii, 151 (1817); *Scirpus palustris* L. Sp. Pl. i, 47 (1753).

Wet places, valley of Lake Tesemini; June 21 (No. 685).

Scirpus lacustris occidentalis Wats. Bot. Cal. ii, 218 (1880).

Wet shores, valley of Lake Tesemini, Kootenai County; July 21 (No. 687).

Scirpus microcarpus Presl, Rel. Haenk. i, 195 (1828).

Wet mountain meadows, valley of Traille River, Kootenai County; August 9 (No. 881).

Scirpus nanus Spreng. Pug. i, 4 (1815); *Eleocharis pygmæa* Torr. Ann. Lyc. N. Y. iii, 313 (1836).

Three miles south of Viola, Latah County; June 26 (No. 1052).

Scirpus subterminalis Torr. Fl. U. S. i, 47, (1824).

Ponds at Granite Station, Kootenai County; July 29 (781).

Carex amplexifolia Boott; Hook. Fl. Bor. Amer. ii, 228, t. 226 (1839).

Wet places, south end of Lake Pend d'Oreille; July 28 (No. 761).

Carex aperta Hook. Fl. Bor. Amer. ii, 218 (1840).

Wet places, valley of Cœur d'Alene River; July 12 (No. 634).

Carex athrostachya Olney, Proc. Amer. Acad. vii, 393 (1868).

Frequent in meadows, head of Little Potlatch River, Latah County; June 20 (No. 448). Wet places near Rathdrum, Kootenai County; July 25 (No. 716).

Carex canescens brunnescens (Pers.) Poir. Encycl. Suppl. iii, 286 (1813); *C. canescens alpicola* Wahl. Fl. Lapp. 232 (1812); *C. curta brunnescens* Pers. Syn. ii, 539 (1807).

Canyons, south end of Lake Pend d'Oreille; August 1 (No. 814).

Carex capillaris L. Sp. Pl. ii, 977 (1753).

On precipitous ledges of granite, south end of Lake Pend d'Oreille; July 29 (No. 751).

Carex deflexa media Bailey, Mem. Torr. Club, i, 43 (1889).

Mountains, south end of Lake Pend d'Oreille; August 3 (No. 820). At 2,550 meters altitude on Packsaddle Peak, Kootenai County; August 5 (No. 841).

Carex deflexa rossii (Boott) Bailey, Mem. Torr. Club, i, 43 (1889); *C. rossii* Boott; Hook. Fl. Bor. Amer. ii, 222 (1838).

Common in canyons, valley of Lake Waha, Nez Perces County; May 23 (No. 234).

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[1]The Cyperaceæ were determined by Mr. C. F. Wheeler, Agricultural College, Michigan.

Carex deweyana sparsiflora (Olney) Bailey, Bot. Gaz. xiii, 87 (1888); *C bolanderi sparsiflora* Olney; Bailey, loc. cit. as synonym.

Woods, valley of Pine Creek, near Farmington, Latah County; June 28 (No. 518).

Carex exsiccata Bailey, Mem. Torr. Club, i, 6 (1889).

Frequent in wet places, valley of the Little Potlatch River, Latah County; June 16 (No. 417).

Carex festiva Dew. Amer. Journ. Sci. xxix, 246 (1836).

Common in wet places, valley of Big Potlatch River, Nez Perces County; June 9 (No. 357). Same situations, Farmington Landing, Lake Cœur d'Alene; July 6 (No. 568).

Carex festiva polystachya Bailey, Mem. Torr. Club, i, 51 (1889).

Frequent on river banks, mouth of Big Potlatch River, Nez Perces County; May 3 (No. 104).

Carex filiformis lanuginosa (Mx.) B. S. P. Prel. Cat. N. Y. 63 (1888); *C. lanuginosa* Mx. Fl. ii, 175 (1803); *C. filiformis latifolia* Bœckl. Linnæa, xii, 300 (1877).

Frequent in meadows, head of Little Potlatch River, Latah County; June 20 (No. 449). Wet places near Rathdrum, Kootenai County; July 25 (No. 721).

Carex flava recte-rostrata Bailey, Bot. Gaz. xiii, 84 (1888).

Shores of Lake Pend d'Oreille, at Hope, August 20 (No. 931).

Carex geyeri Boott, Trans. Linn. Soc. xx, 118 (1846).

Frequent on hillsides, valley of Lake Waha, Nez Perces County; May 22 (No. 224). Mountain heights, Wiessner's Peak, Kootenai County; July 8 (No. 606).

Carex interrupta impressa Bailey, Mem. Torr. Club, i, 18 (1889).

Wet places, valley of Lake Tesemini, Kootenai County; July 21 (No. 693). Wet shores near Hope, north end of Lake Pend d'Oreille; August 20 (No. 933).

Carex leptalea Wahl. Kongl. Vet. Acad. Handl. ser. 2, xxiv, 139 (1803); *C. polytrichoides* Willd.; Wahl. loc. cit. as synonym.

Swamps, Granite Station, Kootenai County; July 30 (No. 800).

Carex limosa L. Sp. Pl. ii, 977 (1753).

Marshes, Granite Station, Kootenai County; July 30 (No. 809).

Carex nebraskensis prævia Bailey, Mem. Torr. Club, i, 49 (1889).

Wet places, near Viola, Latah County, June 26 (No. 502).

Carex pratensis Drejer, Rev. Crit. Car. Bor. 24 (1841).

Common in wet places, head of Little Potlatch River, Latah County; June 20 (No. 452).

Carex preslii Steud. Pl. Cyp. 242 (1855).

Slopes of Wiessner's Peak, Kootenai County; July 8 (No. 610).

Carex pseudo-cyperus americana Hochst. Herb. Unio Itin. (1837).

Marshes, Granite Station, Kootenai County; July 30 (No. 811).

Carex pyrenaica Wahl. Kongl. Acad. Handl. xxiv, 139 (1802).

On mountains of Packsaddle Peak, Kootenai County; August 6 (No. 850).

Carex retrorsa Schwein. Ann. Lyc. N. Y. i, 71 (1824).

Wet places, Farmington Landing, Lake Cœur d'Alene; July 6 (No. 567). Wet places, Granite Station, Kootenai County; July 29 (No. 774).

Carex reynoldsii Dew. Amer. Journ. Sci. xxxii, 39 (1837).

Mountain meadows, valley of Traille River, Kootenai County, August 10 (No. 891).

Carex scoparia Schk. Riedgr. Nachtr. 20, f. 175 (1806).

Wet places, valley of Cœur d'Alene River, Kootenai County; July 14 (No. 648).

Carex stipata Muhl.; Willd. Sp. Pl. iv, 233 (1805).

Wet places, valley of Big Potlatch River, Nez Perces County; June 9 (No. 359). Valley of the Cœur d'Alene River, Kootenai County; July 13 (No. 638).

Carex straminea festucacea (Willd.) Tuckerm. Enum. Meth. 18 (1843); *C. festucacea* Willd. Sp. Pl. iv, 242 (1805).

Rocky banks of the Clearwater River, Nez Perces County; June 2 (No. 295). Common in meadows, valley of Big Potlatch River, Nez Perces County; June 9 (No. 367).

Carex tenella Schk. Riedgr. 23, f. 104 (1801).

Meadows, Granite Station, Kootenai County; July 30 (No. 798).

Carex teretiuscula ampla Bailey, Mem. Torr. Club, i, 53 (1889).

Wet places at the North Fork of Hangman's Creek, Indian reservation, Latah County; July 1 (No. 528).

Carex utriculata minor Boott; Hook. Fl. Bor. Amer. ii, 221 (1839).

Wet places at Granite Station, Kootenai County; July 29 (No. 788).

GRAMINEÆ.

By L. H. Dewey.

The grasses obtained on this expedition, amounting to 120 numbers, form a most important part of the collection from an economic standpoint. The vegetable resources of that region for some time to come will consist chiefly in the native forests for the production of lumber, and in the native pastures for the production of beef and mutton. The collectors' notes indicate that many of the mountain meadows, the lake shores, and the alluvial deposits along the river bottoms abound in grasses mostly unlike those found east of the Mississippi River, but many of them evidently just as valuable for grazing, and certainly better adapted to that region than any which are cultivated in the East. A careful and considerate use of these grazing lands will permit them to continue productive and valuable for many years, while a single season of overstocking is likely to ruin them for all time, as the more valuable varieties are always killed out first, and their places are usually taken by less valuable annual plants or by weeds that are positively injurious. Some of the grasses collected are certainly worthy of trial in cultivation, and may form valuable additions to our cultivated grasses. At least half a dozen varieties even in their wild state are as valuable as many of the grasses introduced from Europe that have been developed by long cultivation.

An exact knowledge of the economic values of grasses must be based to some extent upon a technical knowledge of their systematic relationships and their morphological characters. This collection is no less valuable as an aid to our knowledge in these lines. It is the first collection of real importance that has been made in exactly this region. Nuttall, Hooker, Howell, Suksdorf, and others have collected on the Columbia River and west of the Cascade Mountains, while Scribner, Tweedy, and Williams have worked over a large part of Montana; but the region just west of the Bitter Root Mountains was almost unknown

to the agrostologist, as well as to other botanists. The grasses composing this collection are in exceptionally good condition for systematic work, and in many instances the series of varying forms seems to be well represented, so that the specimens will certainly prove valuable for future study.

Panicum capillare minus Muhl. Gram. Descr. 124 (1817).

Damp places near Rathdrum, Kootenai County; July 25 (No. 713).

Panicum pubescens Lam. Encycl. iv, 748 (1797).

Shores at Farmington Landing, Lake Cœur d'Alene; July 11 (No. 616). Sandy soil, valley of Cœur d'Alene River, Kootenai County; July 13 (No.643). Hope, shore of Lake Pend d'Oreille; August 24 (No. 948).

All of the forms represented by these numbers have heretofore been referred to the ambiguous species, *Panicum dichotomum* L.

Panicum scoparium Lam. Encycl. iv, 744 (1797).

Frequent on sandy soil, valley of Clearwater River, Nez Perces County; June 2 (No. 296).

Phalaris arundinacea L. Sp. Pl. i, 55 (1753).

Alluvial soil, Farmington Landing, Lake Cœur d'Alene, July 5 (No. 563).

Aristida fasciculata fendleriana (Steud.) Vasey, Contr. Nat. Herb. ii, 515 (1894).

River banks, Spokane Bridge, 18 miles east of Spokane, Washington; August 16 (No. 906).

This is one of the forms of the variable *Aristida fasciculata* Torr. (*A. purpurea* Nutt.) and approaches most nearly to the variety *fendleriana;* but the range of that variety, as known heretofore, does not extend north of Colorado and Utah.

Stipa comata Trin. & Rupr. Mem. Acad. St. Pet. ser. 6, v, 75 (1849).

Sandy soil, scarce, valley of Clearwater River, Nez Perces County; June 2 (No. 293).

Stipa viridula Trin. Bull. Sci. Acad. St. Pet. i, 67 (1836).

Sandy soil on Hellgate River, Bonner, Missoula County, Montana; August 30 (No. 986).

Alopecurus californicus Vasey, Bull. Torr. Club xv, 13 (1888).

Wet meadows, head of Little Potlatch River, Latah County; June 16 (Nos. 396, 415).

This robust, leafy grass is apparently as promising for cultivation in moist meadows as the European foxtail, *Alopecurus pratensis*, from which it differs chiefly in its looser spikes with smaller spikelets.

Alopecurus geniculatus fulvus (Smith) Scribn. Mem. Torr. Club, v, 38 (1894); *A. fulvus* Smith, Engl. Bot. t. 1467 (1793); *A. geniculatus aristulatus* (Mx.) Torr. Fl. U. S. i, 97 (1824); *A. aristulatus* Mx. Fl. i, 43 (1803).

Along creeks, valley of Lake Pend d'Oreille; August 23 (No. 947).

Polypogon monspeliensis (L.) Desf. Fl. Alt. i, 67 (1798); *Alopecurus monspeliensis* L. Sp. Pl. i, 89 (1753).

Sandy soil, near Spokane, Washington; August 17 (No. 920).

Cinna pendula glomerula Scribner, Proc. Acad. Phila. 1884, 290 (1884).

Along creeks near Rathdrum, Kootenai County, July 25 (No. 724).

This is a robust form with rough sheaths and leaves nearly 1 cm. wide, and with the florets nearly sessile in the numerous small spikelets, which are somewhat crowded in clusters along the rays of the ample panicle.

Agrostis exarata Trin. Dis. Unif. 207 (1824).

Bottom lands, valley of Cœur d'Alene River, Kootenai County; July 13 (No. 646). Wet places, valley of Traille River, Kootenai County; August 9 (No. 883).

Agrostis exarata asperifolia (Trin.) Thurb. Bot. Cal. ii, 273 (1880); *A. asperifolia* Trin. Mem. Acad. St. Pet. Sci. Nat. ser. 6, 318 (1845).

Gravel banks and in streams, valley of Traille River, Kootenai County; August 8 (No. 878).

Agrostis scabra Willd. Sp. Pl. i, 370 (1798); *A. hiemalis* (Walt.) B. S. P. Prel. Cat. N. Y. 68 (1888); *Cornucopiæ hyemalis* Walt. (?) Fl. Car. 74 (1788).

Sandy soil, Farmington Landing, Lake Cœur d'Alene; July 4 (No. 547).

Calamagrostis canadensis (Mx.) Beauv. Agrost. 15 (1812); *Arundo canadensis* Mx. Fl. i, 73 (1803).

Alluvial soil, Farmington Landing, Lake Cœur d'Alene; July 5 (No. 561). Canyons, same locality; July 7 (No. 578). Shores, valley of Lake Tesemini, Kootenai County; July 21 (No. 694).

Calamagrostis canadensis dubia (Scribner) Vasey, Contr. Nat. Herb. iii, 80 (1892); *Deyeuxia dubia* Scribn. Bot. Gaz. xi, 174 (1886).

Bottom lands, valley of Cœur d'Alene River, Kootenai County; July 13 (No. 637).

Calamagrostis cusickii Vasey, Ill. N. A. Gr. ii, 39 (1892); *Deyeuxia cusickii* Vasey, Bot. Gaz. x, 224 (1885).

Hillsides, Farmington Landing, Lake Cœur d'Alene; July 12 (No. 630).

Calamagrostis suksdorfii Scribner; Vasey, Contr. Nat. Herb. iii, 82 (1892).

Farmington Landing, Lake Cœur d'Alene; July 6 (No. 564). Dry ridges, valley of Lake Tesemini, Kootenai County; July 21 (No. 682). Woods at the south end of Lake Pend d'Oreille; July 28 (No. 769).

Nos. 682 and 769 with straw-colored panicles are typical forms of the species, but No. 564, not quite mature, is referred to it with some doubt.

Calamovilfa longifolia (Hook.) Hack. True Grasses, 113 (1890); *Calamagrostis longifolia* Hook. Fl. Bor. Amer. ii, 241 (1840).

Plains, Colgate, near Glendive, Dawson County, Montana; September 5 (No. 999).

This species, with its strong, creeping rootstocks, is valuable for holding the light, drifting sands in the prairie region.

Deschampsia cæspitosa (L.) Beauv. Agrost. 91 (1812); *Aira cæspitosa* L. Sp. Pl. i, 64 (1753).

Wet places, head of Little Potlatch River, Latah County; June 17 (No. 419). Meadows, same locality; June 18 (No. 433). Canyons at Farmington Landing, Lake Cœur d'Alene; July 7 (No. 579). Hope, north end of Lake Pend d'Oreille, Kootenai County; August 21 (No. 945).

Deschampsia calycina Presl, Rel. Haenk. i, 251 (1830).

Frequent on sandy soil, valley of the Big Potlatch River, Nez Perces County; June 6 (No. 323).

Deschampsia elongata (Hook.) Munro; Benth. Pl. Hartw. 342 (1857); *Aira elongata* Hook. Fl. Bor. Amer. ii, 243, t. 228 (1840).

Common in copses, valley of Big Potlatch River, Nez Perces County; June 9 (No. 374). Moist places, head of Little Potlatch River, Latah County; June 18 (No. 439).

Trisetum canescens Buckley, Proc. Acad. Phila. 1862, 100 (1862).

Meadows, head of Little Potlatch River, Latah County; June 18 (No. 438). Moist places, same locality; June 20 (No. 440).

Trisetum cernuum Trin. Mem. Acad. St. Pet. ser. 6, i, 61 (1831).

Frequent in moist places, valley of Big Potlatch River, Nez Perces County; June 9 (No. 369). Farmington Landing, Lake Cœur d'Alene; July 4 (No. 541).

Trisetum subspicatum (L.) Beauv. Agrost. 88 (1812); *Aira subspicata* L. Syst Veg. ed. 10, 673 (1769).

Mountains, south end of Lake Pend d'Oreille; August 3 (No. 819). Mountains of Packsaddle Peak, Kootenai County; August 6 (No. 848).

Danthonia californica Boland. Proc. Cal. Acad. ii, 182 (1862–63).

Meadows, head of Little Potlatch River, Latah County; June 21 (No. 476).

Danthonia californica unispicata Thurb. Bot. Cal. ii, 294 (1880).

Dry hills, head of Little Potlatch River, Latah County; June 20 (No. 453).

Spartina cynosuroides (L.) Willd. Enum. Pl. 80 (1809); *Dactylis cynosuroides* L. Sp. Pl. i, 71 (1753).

Shores of Lake Tesemini, Kootenai County; July 21 (No. 691).

Kœleria cristata (L.) Pers. Syn. i, 97 (1805); *Aira cristata* L. Sp. Pl. i, 63 (1753).

Sandy soil on Little Potlatch River, Nez Perces County; June 7 (No. 333).

Melica subulata (Griseb.) Scribner, Proc. Acad. Phila. 1885, 47 (1885); *Bromus subulatus* Griseb. Fl. Ross. iv, 358 (1849); *Melica acuminata* Boland. Proc. Cal. Acad. iv, 104 (1866).

Frequent in canyons, valley of Little Potlatch River, Latah County; June 13 (No. 387). Mountains, south end of Lake Pend d'Oreille; August 11 (No. 827).

Poa annua rigidiuscula var. nov.

Culms 15 to 20 cm. high, rather robust, striate, glabrous, leafy to the middle, tufted from running rootstocks, evidently perennial; leaves flat, mostly erect, abruptly acute or rounded at apex, 2 to 4 mm. wide, 2 to 5 cm. long; ligule obtuse, about 2 mm. long; sheaths smooth, shorter than the internodes, the lower ones membranaceous, the upper one keeled; panicle pyramidal, 3 to 4 cm. long, and spreading to nearly that width at the base; axis rigidly erect with 5 or 6 nodes; rays 2 to 4 at the base, 2 or single above, spikelet-bearing beyond the middle, smooth, rigid, and divaricate, or somewhat reflexed; spikelets 3- to 5- (usually 4-) flowered, about 5 mm. long; empty glumes smooth, nearly equal in length, nearly two-thirds as long as the lower floret, the first narrowly ovate, acute, the second broadly lanceolate, obtuse; floral glume 3 mm. long, broadly lance-oblong, obtuse, membranaceous above, prominently ciliate on the 5 nerves below the upper third; palet about one-fourth shorter than its glume, prominently ciliate on the keels; grain yellow, subtranslucent, slightly rugose under the lens, 1.5 mm. long, one-third as thick, slightly flattened or triquetrous, with a tuft of hairs at the apex. This variety differs from the type of the species in the running rootstock, rather robust rigid culms, short subobtuse leaves, rigid panicle, larger florets, and pubescent floral glumes.

Type specimen collected at Lapwai Agency, Nez Perces County, by J. H. Sandberg; May 5, 1892 (No. 134). Also found on the plains of eastern Oregon. It is said to be common in rich soil in this region.

Poa compressa L. Sp. Pl. i, 69 (1753).

Dry hillsides near Farmington Landing, Lake Coeur d'Alene; July 2 (No. 534).

Poa filifolia Vasey, Contr. Nat. Herb. i, 271 (1893).

"Culms densely clustered, from a slender rootstock, erect, slender, 16 to 24 inches high, with 2 or 3 distant, narrow, short-bladed leaves; radical leaves abundant, filiform, 6 to 10 inches long, flaccid, erect; leaves of the culm 2 to 3, distant, with long sheaths and short (1 to 3 inches), erect, filiform blades; ligule less than 1 line long, acute; panicle loose and flexuous, 3 to 4 inches long; branches capillary, scabrous, rather distant, the lower in twos or threes, unequal, the longer about 1.5 inches long, with few spikelets near the extremity, naked below; spikelets compressed, 3 to 5 lines long, rather loosely 5- to 7-flowered, on filiform pedicels; empty glumes nearly equal, one-third shorter than the adjacent florets, lance-ovate, acute, broadly scarious-margined; floral

glumes 2.5 to 3 lines long, lance-oblong, subacute, scarious at the apex, minutely scabrid throughout, slightly more so on the keel, intermediate nerves rather indistinct; palet nearly equaling the glume, scabrous on the keels."

Frequent on rocky hillsides, island in Clearwater River, near Upper Ferry, above Lewiston; May 2 (No. 86). Northern slopes, on Hatwai Creek, Nez Perces County; May 6 (No. 138, type number).

Poa flava L. Sp. Pl. i, 68 (1753); *Poa serotina* Ehrh. Beitr. vi, 83 (1791).

Wet places, near Farmington Landing, Lake Cœur d'Alene; July 4 (No. 543). Sandy soil, valley of Cœur d'Alene River, Kootenai County; July 12 (No. 632). Bottom lands, same locality; July 13 (No. 644). Moist places, valley of Big Potlatch River, Nez Perces County; June 9 (No. 1051).

Poa nemoralis L. Sp. Pl. i, 69 (1753).

Sandy soil, Farmington Landing, Lake Cœur d'Alene; July 4 (No. 545).

Poa nevadensis Vasey, Bull. Torr. Club, x, 66 (1883).

Frequent by roadsides, valley of Clearwater River, Nez Perces County; May 30 (No. 266). Banks of Big Potlatch River, Nez Perces County; June 4 (No. 305). Roadsides, same locality; June 9 (No. 354). Copses, same locality; June 9 (No. 375). Near Viola, Latah County; June 26 (No. 505).

This robust long-leafed "mountain blue grass" is one of the most valuable forage grasses in the region where it grows, and it is apparently well worthy of being tried in cultivation.

Poa pratensis L. Sp. Pl. i, 67 (1753).

Sparingly in meadows, head of Little Potlatch River, Latah County; June 18 (No. 437). Along creeks, 4 miles east of Farmington, Latah County; June 28 (No. 515). Sandy soil, Farmington Landing, Lake Coeur d'Alene; July 4 (No. 546).

Numbers 437 and 546 represent a peculiar mountain form of this species, somewhat more robust than usual, with a rather loose panicle of spikelets slightly larger than the average size of those in the eastern form, and usually more or less brightly colored with purple, often appearing almost iridescent through the coloration of the floral glumes. This form and also numerous intermediate forms connecting this with the typical form of the species have been collected in many localities in the Rocky Mountains from Northern Arizona and New Mexico to British America. It has been cultivated with success at one of the Canadian experiment farms.

Poa sandbergii Vasey, Contr. Nat. Herb. i, 276 (1893).

"Culms tufted, 10 to 16 inches long, slender, upper portion naked, the lower portions bearing about two sheaths with very short blades; leaves 2, the blade 1 inch long or less; ligule about 1 line long; panicle 1.5 to 3 inches long, sometimes very narrow, or less than 1 inch wide, the branches ascending, nearly smooth, the lower in twos or threes, unequal, the longer one 1 to 2 inches long, spikelet-bearing above the middle; spikelets short-pediceled, 2- to 4-flowered about 3 lines long, often purplish; empty glumes lanceolate, subacute, about two-thirds as long as the adjacent florets; floral glumes linear-oblong, obtuse, nearly 2 lines long, sparsely pubescent or puberulent, somewhat villose near the base but not webbed, scarious at the apex; palet equaling its glume, pubescent on the keels; internode of the rachilla puberulent, one-half line long."

"It approaches some forms of *Poa tenuifolia* Nutt., from which it may be distinguished by its smaller spikelets, shorter florets, and more pubescent floral, glumes."

Grassy slopes, valley of Clearwater River, Nez Perces County; May 14, (No. 164).

Poa tenuifolia Nutt. Proc. Acad. Phila. 1862, 96 (1862).

Frequent on banks of Hatwai Creek, Nez Perces County; May 17 (No. 183). Hillsides, valley of Clearwater River, Nez Perces County; May 17 (No. 187). Rocky places, scarce, near Hatwai Creek, Nez Perces County; May 27 (No. 260). Meadows near Viola, Latah County; June 26 (No. 503).

Graphephorum wolfii Vasey, Grasses of the U. S. 42 (1883); *Trisetum wolfii* Vasey, Bot. Wheeler Surv. 194, t. 27 (1878).

Frequent in meadows, head of Little Potlatch River, Latah County; June 18 (No. 435).

Panicularia fluitans (L.) Kuntze, Rev. Gen. Pl. 782 (1891); *Festuca fluitans* L. Sp. Pl. i, 75 (1753); *Glyceria fluitans* R. Br. Prodr. Fl. Nov. Holl. i, 179 (1810).

Wet places near Rathdrum, Kootenai County; July 20 (No. 670). Wet shores, valley of Lake Tesemini, Kootenai County; July 22 (No. 702).

Panicularia nervata (Willd.) Kuntze, Rev. Gen. Pl. ii, 783 (1891); *Poa nervata* Willd. Sp. Pl. i, 389 (1798); *Glyceria nervata* Trin. Mem. Acad. St. Pet. ser. 6, i, 365 (1831).

Frequent in wet places, valley of Big Potlatch River, Nez Perces County; June 9 (Nos. 358, 360). Similar localities, valley of Little Potlatch River, Latah County; June 13 (No. 392). Farmington Landing, Lake Cœur d'Alene; July 4 (No. 540). Valley of Traille River, Kootenai County; August 8 (No. 876).

Panicularia pauciflora (Presl) Kuntze, Rev. Gen. Pl. ii, 783 (1891); *Glyceria pauciflora* Presl, Rel. Haenk. i, 257 (1830).

Near springs, scarce, valley of Big Potlatch River, Nez Perces County; June 9 (No. 356). Wet places, valley of Cœur d'Alene River, Kootenai County; July 13 (No. 636).

Panicularia remota (Fors.) Kuntze, Rev. Gen. Pl. ii, 782 (1891); *Poa remota* Fors. Act. Inst. Linn. Ups. i, t. 1 (1807); *Glyceria arundinacea* Kunth, Enum. i, 367 (1833).

Along creeks near Rathdrum, Kootenai County; July 25 (No. 718).

This belongs to a form readily recognized by its thick, almost succulent culm, broad leaves, and ample panicle of rather large spikelets.

Festuca jonesii Vasey, Contr. Nat. Herb. i, 278 (1893).

Frequent in wet places, valley of Little Potlatch River, Nez Perces County; June 14 (No. 394).

This species has often been mistaken for *F. occidentalis* Hook., which it resembles in the inflorescence, but it may be readily distinguished by its tall culms with abundant flat leaves.

Festuca microstachys Nutt. Journ. Acad. Phila. ser. 2, i, 187 (1847).

Rocky ground on Peter Creek, Nez Perces County; May 4 (No. 124).

Festuca myurus L. Sp. Pl. i, 74 (1753).

Frequent in sandy soil, valley of Clearwater River, Nez Perces County; June 2 (No. 291).

Festuca octiflora Walt. Fl. Car. 81 (1788); *Festuca tenella* Willd. Enum. i, 113 (1809).

Sandy river banks, scarce, valley of Clearwater River, Nez Perces County; June 2 (No. 290).

Festuca oregona Vasey, Bot. Gaz. ii, 126 (1877).

Meadows, near Viola, Latah County; June 26 (No. 504). Dry ridges, valley of Lake Tesemini, Kootenai County; July 21 (No. 683). On mountains at 900 meters altitude, same locality; July 22 (No. 703).

Festuca ovina L. Sp. Pl. i, 73 (1753).

Frequent in copses, head of Little Potlatch River, Latah County; June 20 (No. 451).

Festuca ovina polyphylla Vasey, ined.

Frequent in dry, sandy soil, valley of Little Potlatch River, Latah County; June 13 (No. 388).

This is the form which has been mentioned in published lists, but as the forms and named varieties of this group of *Festucas* are in a very unsettled state it is thought best not to give a description until the entire genus can be carefully studied.

Festuca rubra longearistata Hack. ined.

Farmington Landing, Lake Cœur d'Alene; July 4 (No. 544).

This form agrees well with specimens in the National Herbarium labeled with this name by Dr. Eduard Hackel, but its description is deferred for the reason already mentioned.

Festuca scabrella major Vasey, Contr. Nat. Herb. i, 278 (1893).

Plains on the North Fork of Hangman's Creek, Indian Reservation, Latah County; July 1 (No. 530).

Festuca viridula Vasey, Ill. N. A. Gr. ii, 93 (1893).

Summits of Packsaddle Peak, Kootenai County; August 5 (No. 831).

Bromus breviaristatus (Hook.) Buckl. Proc Acad. Phila. 1862, 98 (1862); *Ceratochloa breviaristata* Hook. Fl. Bor. Amer. ii, 253 (1840).

Common on rocky banks of Peter Creek, Nez Perces County; May 4 (No. 123). Waste ground, valley of Clearwater River, Nez Perces County; May 14 (No. 166). Roadsides, valley of Little Potlatch River, Nez Perces County; June 7 (No. 331). Meadows, head of Little Potlatch River, Latah County; June 18 (No. 434).

Bromus brizæformis Fisch. & Mey. Ind. Sem. Petrop. iii, 30 (1836).

In meadows, only near Viola, Latah County; June 23 (No. 482).

Bromus ciliatus L. Sp. Pl. i, 76 (1753).

Open places, valley of Pine Creek, near Farmington, Latah County; June 29 (No. 523). Canyons, Farmington Landing, Lake Cœur d'Alene; July 7 (No. 582). Woods on the St. Joseph River, Wiessner's Peak, Kootenai County; July 8 (No. 599).

Bromus hordeaceus L. Sp. Pl. i, 77 (1753); *Bromus mollis* L. Sp. Pl. ed. 2, i, 112 (1762).

Frequent on waste ground, valley of Clearwater River, Nez Perces County; May 14 (No. 167).

Bromus secalinus L. Sp. Pl. i, 76 (1753).

Hillsides, south shore of Lake Cœur d'Alene; July 1 (No. 531).

Agropyron divergens Nees; Steud. Syn. Gram. 347 (1855).

Frequent on rocky ground, valley of Clearwater River, Nez Perces County; May 16 (No. 178). Sandy river banks, same locality; June 2 (No. 297). Hillsides, valley of Little Potlatch River, Latah County; June 13 (No. 382). Meadows near Viola, Latah County; June 23 (No. 481). On basaltic rocks at Farmington Landing, Lake Cœur d'Alene; July 5 (No. 559).

Agropyron repens glaucum (Desf.) Scribner, Mem. Torr. Club, v, 57 (1894); *Triticum glaucum* Desf. Tabl. Bot. Mus. 16 (1804); *Agropyron glaucum* Roem. & Schult. Syst. Veg. ii, 752 (1817).

Mountains near Lake Tesemini, Kootenai County; July 22 (No. 704).

Agropyron tenerum Vasey, Bot. Gaz. x, 258 (1885).

Rocky ground, valley of Clearwater River, Nez Perces County; May 16 (No. 179). Dry prairies near Rathdrum, Kootenai County; July 25 (No. 714).

Agropyron violaceum major Vasey, Contr. Nat. Herb. i, 280 (1893).

Farmington Landing, shore of Lake Cœur d'Alene; July 5 (No. 556).

Hordeum jubatum L. Sp. Pl. i, 85 (1753).

Common on waste grounds, near Viola, Latah County; June 23 (No. 483).

Hordeum nodosum L. Sp. Pl. ed. 2, i, 126 (1762).

Frequent in sandy soil, valley of Clearwater River, Nez Perces County; May 9 (No. 146). Meadows near Viola, Latah County; June 26 (No. 493). Valley of Lake Pend d'Oreille; August 25 (No. 958).

This form, which is referred here until the genus can be more thoroughly studied, differs from the type in the short, flat leaves, pubescent on both sides, with inflated sheaths, the lower sheaths being retrorsely pubescent; in the spikes shorter and thicker than usual, with awns 10 to 15 mm. long, and in the sterile florets on stipes about 1½ mm. long.

Hordeum pusillum Nutt. Gen. i, 87 (1818).

Hillsides, scarce, valley of Big Potlatch River, Nez Perces County; June 8 (No. 370).

Elymus canadensis L. Sp. Pl. i, 83 (1753).

On Hellgate River, Bonner, Missoula County, Montana; August 30 (No. 982).

Elymus condensatus Presl, Rel. Haenk. i, 265 (1830).

Frequent in sandy soil, valley of Hatwai Creek, Nez Perces County; May 27 (No. 262).

Elymus glaucus Buckl. Proc. Acad. Phila. 1862, 99 (1862); *Elymus sibiricus* Hook. Fl. Bor. Amer. ii, 255 (1840), not L.; *Elymus americanus* Vasey & Scribner, in Macoun, Cat. Can. Pl. 245 (1888).

Common in copses, valley of Big Potlatch River, Nez Perces County; June 9 (No. 353). Along creeks, Farmington Landing, Lake Cœur d'Alene; July 6 (No. 571).

CONIFERÆ.[1]

Pinus contorta Loudon, Arb. et Frut. iv, 2292, f. 2210, 2211 (1838).

Woods, Farmington Landing, Lake Cœur d'Alene; July 12 (No. 627).

Pinus ponderosa Dougl.; Lawson's Manual, 354 (1836)

Banks of Clearwater River, Nez Perces County; April 26 (No. 51).

A good-sized tree.

Larix occidentalis Nutt. Sylva, iii, 143, t. 120 (1849).

Common in woods, at 600 meters altitude, Craig Mountains, near Lake Waha, Nez Perces County; May 20 (No. 206).

Sometimes 6 or 8 feet in diameter.

Juniperus nana Willd. Berl. Baumz. ed. 1, 159 (1796); *J. communis* Gaudich. Fl. Helv. vi, 301 (1830).

Summits of Packsaddle Peak, Kootenai County; August 5 (No. 830).

Juniperus virginiana L. Sp. Pl. ii, 1039 (1753).

Rocky shore at south end of Lake Pend d'Oreille; August 4 (No. 824).

Tsuga mertensiana (Bong.) Carriere, Trait. Conif. ed. 2, 250 (1867); *Pinus mertensiana* Bong. Veg. Sitch. 163 (1831).

Canyons near Rathdrum, Kootenai County; July 23 (No. 708).

Pseudotsuga mucronata (Raf.) Sudworth, nom. nov.; *Pinus taxifolia* Lamb. Pinus, ed. 1, 51, t. 33 (1803), not Salisb. (1796); *Abies mucronata* Raf. Atl. Journ. 119 (1832); *Ps. douglasii* Carrière, Trait. Conif. nouv. éd. 256 (1867); *Ps. taxifolia* Britton, Trans. N. Y. Acad. viii, 741 (1889).

Woods, Farmington Landing, Lake Cœur d'Alene; July 12 (No. 629).

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[1] The *Coniferæ* were determined by Mr. George B. Sudworth, botanist of the Division of Forestry, U. S. Department of Agriculture.

Abies grandis Lindl. Penn. Cycl. i, 30 (1833).

Common in woods at 900 meters altitude, Craig Mountains, near Lake Waha, Nez Perces County; May 20 (No. 205). Woods, Farmington Landing, Lake Cœur d'Alene; July 12 (No. 626).

Thuya plicata Lamb. Pinus, ii, 19 (1824); *T. gigantea* Nutt. Journ. Acad. Phila. vii, 52 (1834).

Near Hope, at the north end of Lake Pend d'Oreille; August 25 (No. 967). A tree 3 to 5 meters in diameter.

Taxus brevifolia Nutt. Sylva, iii, 86, t. 108 (1849).

Trailing in habit.

In woods, valley of Traille River, Kootenai County; August 8 (No. 886).

EQUISETACEÆ.[1]

Equisetum arvense L. Sp. Pl. ii, 1061 (1753).

Common along Hatwai Creek, Nez Perces County; April 28 (No. 64). Wet places, valley of Clearwater River, Nez Perces County; May 13 (No. 162).

Equisetum hyemale L. Sp. Pl. ii, 1062 (1753).

Marshes, Granite Station, Kootenai County; July 30 (No. 806). Common, bottom lands along Hatwai Creek, Nez Perces County; April 24 (No. 44).

Equisetum limosum L. Sp. Pl. ii, 1062 (1753).

Alluvial soil, valley of Lake Pend d'Oreille; August 25 (No. 959).

Equisetum robustum A. Braun, Amer. Journ. Sci. xlvi, 88 (1843).

Common in wet places, along Peter Creek, Nez Perces County; May 3 (No. 116). Along irrigation ditches, valley of Clearwater River, Nez Perces County; May 14 (No. 165).

FILICES.

Woodsia oregana Eaton, Can. Nat. ii, 90 (1865).

Common on rocks, valley of Peter Creek, Nez Perces County; May 4 (No. 119). Similar situations, valley of the Big Potlatch River, Nez Perces County; June 6 (No. 327).

Woodsia scopulina Eaton, Can. Nat. ii, 91 (1865).

In crevices of rocks, near Farmington Landing, Lake Cœur d'Alene; July 11 (No. 620). On precipitous ledges of granite, south end of Lake Pend d'Oreille; July 27 (No. 758).

Cystopteris fragilis (L.) Bernh. Schrad. Neues. Journ, Bot. i, 1, 27, t. 2, f. 9 (1799).

Common on rocks, valley of Peter Creek, Nez Perces County; May 4 (No. 1047).

Adiantum pedatum L. Sp. Pl. ii, 1095 (1753).

On precipitous ledges of granite, valley of Lake Pend d'Oreille; July 27 (No. 750).

Cheilanthes gracillima Eaton. Bot. Mex. Bound. 234 (1859).

Mountains near Viola, Latah County; June 26 (No. 500).

Cryptogramme acrostichoides R. Br. in Richards. Bot. App. 767 (1823).

On rocks, near foot of Wiessner's Peak, Kootenai County; July 8 (No. 594).

Pellæa densa Hook. Sp. Fil. ii, 150, t. 125 B (1847).

Crevices of rocks, scarce, Bald Knob, Cedar Mountain, Latah County; June 20 (No. 467).

Pteris aquilina lanuginosa Bong. Veg. Sitch. 176 (1831).

Open woods, among bushes, valley of Lake Pend d'Oreille; August 21 (No. 943).

Asplenium filix-fœmina cyclosorum Rupr. Dist. Crypt. Vasc. 41 (1845).

Along creeks near Rathdrum, Kootenai County; July 25 (No. 723).

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[1] The Pteridophyta were determined by Prof. Lucien M. Underwood, Greencastle, Indiana.

Phegopteris dryopteris robertiana (Hoffm.) Davenp. Cat. Dav. Herb. Suppl. 47 (1883); *Polypodium robertianum* Hoffm. Deutsch. Fl. Add. (1795).

Canyons, Wiessner's Peak, Kootenai County; July 8 (No. 605).

Dryopteris cristata (L.) Gray, Man. (1848); *Aspidium cristatum* Sw. Schrad. Journ. Bot. ii, 37 (1800); *Polypodium cristatum* L. Sp. Pl. ii, 1090 (1753).

Moist woods at Granite Station, Kootenai County; July 29 (No. 795).

Dryopteris filix-mas (L.) Schott, Gen. Fil. (1834); *Aspidium filix-mas* Sw. Schrad. Journ. Bot. ii, 38 (1800); *Polypodium filix-mas* L. Sp. Pl. ii, 1090 (1753).

Woods, on Wiessner's Peak, at 1,800 meters altitude, Kootenai County; July 8 (No. 661). Lake View, east shore of Lake Pend d'Oreille; August 8 (No. 873).

Dryopteris lonchitis (L.) Kuntze, Rev. Gen. Pl. ii, 813 (1891); *Polypodium lonchitis* L. Sp. Pl. ii, 1088 (1753); *Aspidium lonchitis* Sw. Schrad. Journ. Bot. ii, 30 (1800).

Packsaddle Peak at 2,250 meters altitude, near Lake Pend d'Oreille; August 6 (No. 853).

Dryopteris munita (Kaulf.) Kuntze, Rev. Gen. Pl. ii, 813 (1891); *Aspidium munitum* Kaulf. Enum. Fil. 236 (1824).

Frequent in canyons, Bald Knob, Cedar Mountain, Latah County; June 20 (No. 459).

Dryopteris spinulosa dilatata (Hoffm.) Underw. Our Native Ferns, ed. 4, 116 (1893); *Polypodium dilatatum* Hoffm. Deutsch. Fl. ii, 7 (1795); *Aspidium spinulosum dilatatum* Hook. Brit. Fl. 444 (1830).

Moist woods, Granite Station, Kootenai County; July 30 (No. 799).

Dryopteris spinulosa intermedia (Muhl.) Underw. Our Native Ferns, ed. 4, 116 (1893); *Aspidium intermedium* Muhl.; Willd. Sp. Pl. v, 262 (1810).

Near Lake View, east shore of Lake Pend d'Oreille; August 8 (No. 874).

Phegopteris alpestris (Sw.) Mett. Fil. Hort. Lips. 83 (1856); *Aspidium alpestre* Sw. Syn. Fil. 421 (1806).

Moist places, Packsaddle Peak, Kootenai County; August 6 (No. 858).

OPHIOGLOSSACEÆ.

Botrychium virginianum (L.) Sw. Schrad. Journ. Bot. ii, 111 (1800); *Osmunda virginiana* L. Sp. Pl. ii, 1064 (1753).

Deep woods, near south end of Lake Pend d'Oreille; July 28 (No. 762).

MARSILIACEÆ.

Marsilia vestita Hook. & Grev. Ic. Fil. t. 159 (1831).

Along creeks, valley of the Little Potlatch River, Latah County; June 16 (No. 407). Same situations, Spokane Bridge, 18 miles east of Spokane, Washington; August 15 (No. 901). Also near south end of Lake Pend d'Oreille.

No. 407 is the smooth aquatic form; No. 901 the amphibious fruiting form.

LYCOPODIACEÆ.

Lycopodium annotinum L. Sp. Pl. ii, 1103 (1753).

Woods, near south end of Lake Pend d'Oreille; July 28 (No. 771).

Lycopodium complanatum L. Sp. Pl. ii, 1104 (1753).

Woods, near south end of Lake Pend d'Oreille; July 28 (No. 770).

SELAGINELLACEÆ.

Selaginella rupestris Spring, in Mart. Fl. Bras. i, pt. 2, 118 (1840).

Occasionally on rocks, valley of Clearwater River, Nez Perces County; April 26 (No. 54).

MUSCI.[1]

Sphagnum squarrosum spectabile Russ.; Warnstorf, Bot. Gaz. xv, 224 (1890).
Hope, Kootenai County; August (No. 1083).

Gymnostomum curvirostre (Ehrh.) Hedw. Stirp. Crypt. ii, 68, t. 24 (1789); *Pottia curvirostris* Ehrh. Beitr. i, 188 (1787).
Farmington Landing, Kootenai County; July (No. 1095).

Dicranoweisia contermina Ren. & Card. sp. nov.
D. crispulæ valde affinis; differt foliis perichætialibus intimis breviter cuspidatis et cellulis alaribus vix distinctis; a *D. obliqua* Kindb. capsula symmetrica primo visu distincta.
Farmington Landing; July (No. 1093). Hope, Kootenai County; August (Nos. 1167, 1219). Mr. Henderson had also sent this species to Mr. Cardot from Mount Hood, Oregon.

Dichodontium pellucidum (L.) Schimp. Bry. Eur. Coroll. 12 (1855); *Bryum pellucidum* L. Sp. Pl. ii, 1118 (1753).
Hope, Kootenai County; August (No. 1110).

Dicranella crispa (Ehrh.) Schimp. Coroll. Bry. Eur. 13 (1856); *Dicranum crispum* Ehrh.; Hedw. Stirp. Crypt. ii, 91, t. 33 (1788).
Hope, Kootenai County; August (Nos. 1118, 1120).

Dicranum fuscescens Turn. Musc. Hib. 60, t. 5, f. 1 (1804).
Hope, Kootenai County; August (No. 1204).

Dicranum howellii Ren. & Card. Bot. Gaz. xiv, 93, t. xii (1889).
Hope, Kootenai County; August (No. 1109).

Dicranum scoparium (L.) Hedw. Fund. Musc. ii, 92, t. 8, f. 41, 42 (1782); *Bryum scoparium* L. Sp. Pl. ii, 1117 (1753).
Lewiston, Nez Perces County; April, May (No. 1202). Farmington Landing, Kootenai County; July (No. 1072). Hope, Kootenai County; August (No. 1203).

Dicranum starkei Web. & Mohr. Bot. Taschenb. 189 and 471 (1807).
Hope, Kootenai County; August (No. 1104).

Dicranum strictum Schleich. Cent. iii, No. 26 (1806).
No. 1205 has leaves with thickened, pitted cell walls, and is a larger plant than the other numbers, but it has all the other characters of this species.
Lewiston, Nez Perces County, April and May (No. 1205). Farmington Landing, Kootenai County; July (Nos. 1061, 1260).

Ceratodon purpureus (L.) Brid. Bryol. Univ. i, 480 (1826); *Mnium purpureum* L. Sp. Pl. ii, 1111 (1753).
Lewiston, Nez Perces County; April and May (Nos. 1063, 1136); Farmington Landing, Kootenai County; (No. 1201).

Pottia cavifolia Ehrh. Beitr. i, 187 (1787).
Lewiston, Nez Perces County; April and May (No. 1147).

Ditrichum montanum Leiberg, Bull. Torr. Club, xx, 112, t. 143 (1893).
Hope, Kootenai County; August (No. 1119).

Barbula mucronifolia (Brid.) Bruch & Schimp. Mon. 38, t. 23 (1842); *Syntrichia mucronifolia* Brid. Mant. 97 (1819).
Lewiston, Nez Perces County; April and May (No. 1154).

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[1]The difficult and doubtful species of mosses were submitted to Mr. Jules Cardot, except the species of Sphagnum, which were determined by Dr. C. Warnstorf, and those of Orthotrichum, which were submitted to Mrs. E. G. Britton. Mrs. Britton, Mr. Cardot, Professor Barnes, and Mr. L. S. Cheney have also kindly aided in verifying the references.

Barbula mülleri Bruch & Schimp. Bryol. Eur. ii, 44, t. xxviii (1836-51).

Farmington Landing, Kootenai County; July (Nos. 1066, 1237, 1245). Hope, Kootenai County; August (No. 1197).

Scouleria aquatica Hook. Bot. Misc. i, 33, t. 18 (1830).

Hope, Kootenai County; August (No. 1126).

Grimmia alpestris Schleich.; Nees & Hornsch. Bry. Germ. ii, pt. i, 139, t. 21, f. 12 (1827).

Farmington Landing, Kootenai County; July (No. 1077).

Grimmia apocarpa Hedw. Descr. Musc. i, t. 39 (1787).

Farmington Landing, Kootenai County, July (No. 1178).

Grimmia leucophæa Grev. Wern. Trans. iv, 87, t. 6 (1822).

Lewiston, Nez Perces County; April and May (No. 1139).

Grimmia pachyphylla Leiberg, Bull. Torr. Club, xx, 113, t. cxliv (1893).

Hope, Kootenai County; August (No. 1169).

Amphoridium lapponicum (Hedw.) Schimp. Syn. Musc. Eur. 293 (1876); *Gymnostomum lapponicum* Hedw. Descr. Musc. iii, 10, t. 5 (1792); *Anœctangium lapponicum* Hedw. Sp. Musc. 40 (1801).

Lewiston, Nez Perces County; April and May (No. 1200). Hope, Kootenai County; August (No. 1111).

Rhacomitrium lanuginosum (Hedw.) Brid. Musc. Recent. Suppl. iv, 79 (1822); *Trichostomum lanuginosum* Hedw. Descr. Musc. iii, 3, t. 2 (1792).

Farmington Landing, Kootenai County; July (No. 1071).

Rhacomitrium occidentale (Ren. & Card.) Ren. & Card. Musc. Amer. Sept. (1893); *R. heterastichum occidentale* Ren. & Card. Bot. Gaz. xv, 41 (1890); *R. micropus* Kindb.

Farmington Landing, Kootenai County; July (No. 1168).

Rhacomitrium patens (Dicks.) Hüb. Musc. Germ. 198 (1833); *Bryum patens* Dicks. Pl. Crypt. fasc. ii, 6, t. 4, f. 8 (1790).

Farmington Landing, Kootenai County; July (No. 1094).

Rhacomitrium sudeticum (Funck). Bruch. & Schimp. Bryol. Eur. iii, sub Monogr. Rhac. 7, t. i (1836–51); *Trichostomum sudeticum* Funck, Moostasch. 26, t. 18 (1820).

Hope, Kootenai County; August (No. 1163).

Orthotrichum fastigiatum Bruch; Brid. Bryol. Univ. i, 795 (1826).

Hope, Kootenai County; August (No. 1102).

Orthotrichum holzingeri Ren. & Card. sp. nov.

Ab *O. stenocarpo* (*macounii*) capsula sulcata, ab *O. rhabdocarpo* peristomio sicci tate erecto, ab *O. lævigato* capsula sicca sulcata, dentibusque peristomii lævibus vel vix papillosis, siccitate erectis, distinctum. Calyptra pilosa vel nuda.

Mr. Cardot states that he has this species also from Mount Hood, Oregon, communicated by Mr. Henderson, and that in that plant the calyptra is hairy, while in the Idaho plant it is glabrous.

Lewiston, Nez Perces County; April and May (No. 1155).

Orthotrichum rœllii Vent. Bot. Centralb. xliv, 51 (1890); *O. lonchothecium* C. Müll. & Kindb.; *O. stenocarpum* Vent.; *O. macounii* Aust. sec. E. G. Britton.

O. rœllii Vent. and *O. schlottaueri* Vent. seem to constitute a single specific, probably quite variable, type, according to Mr. Cardot.

Lewiston, Nez Perces County; April and May (Nos. 1133, 1140).

Orthotrichum speciosum Nees; Sturm, Deutsch. Fl. abth. ii, 17 (1819).

Lewiston, Nez Perces County; April to May (No. 1060). Hope, Kootenai County; August (No. 1081).

Orthotrichum tenellum Bruch · Brid Bryol Univ. i, 786 (1826).

Mr. Cardot considers this to be *O. pumilum* Sw.

Lewiston, Nez Perces County; April and May (No. 1142).

Tetraphis pellucida Hedw. Fund. Musc. ii, 87, t. 7, f. 32 (1782).
Farmington Landing, Kootenai County; July (No. 1097).

Funaria hygrometrica (L.) Hedw. Sp. Musc. 172 (1801); *Mnium hygrometricum* L. Sp. Pl. ii, 1110 (1753).
Lewiston, Nez Perces County; April and May (No. 1137). Farmington Landing, Kootenai County; July (No. 1212).

Bartramia ithyphylla Brid. Musc. Recent. ii, pt. iii, 132, t. 1, f. 6 (1803).
Hope, Kootenai County, August (No. 1116).

Bartramia menziesii Turn. in Konig & Sims, Ann. Bot. i, 525, t. 11, f. 1 (1805).
Farmington Landing, Kootenai County; July (No. 1085).

Bartramia pomiformis crispa (Sw) Schimp Bryol. Eur. fasc. 12, Monogr. 13 (1842); *Bartramia crispa* Sw. Musc. Suec. 73 (1799).
Farmington Landing, Kootenai County, July (No. 1092). Hope, Kootenai County; August (No. 1179).

Philonotis fontana (L.) Brid. Bryol. Univ. ii, 18 (1827); *Mnium fontanum* L. Sp. Pl. ii, 1110 (1753).
Hope, Kootenai County; August (Nos. 1115, 1223).

Webera commutata Schimp. Syn. Musc. ed. 2, 403, excl. var. β (1876).
Hope, Kootenai County; August (No. 1206).

Webera cruda (L.) Schwæg. Sp. Musc. 50 (1830); *Mnium crudum* L. Sp. Pl. ii, 1112 (1753).
Inflorescence quite variable, No. 1129 being dicecious, No. 1157 synœcious, and No. 1257 polygamous.
Farmington Landing, Kootenai County; July (Nos. 1129, 1257). Hope, Kootenai County; August (No. 1157).

Webera nutans (Schreb.) Hedw. Descr. Musc. i, 10, t. 4 (1787); *Bryum nutans* Schreb. Spic. Fl. Lips. 81 (1771).
Lewiston, Nez Perces County; April and May (No. 1201). Farmington Landing, Kootenai County; July (No. 1156).

Meesia longiseta Hedw. Descr. Musc. i, 36 (1787).
Hope, Kootenai County; August (No. 1100).

Leptobryum pyriforme (L.) Schimp. Syn. Musc. Eur. 390 (1876); *Mnium pyriforme* L. Sp. Pl. ii, 1112 (1753).
Lewiston, Nez Perces County; April and May (Nos. 1144, 1227).

Bryum cæspiticium L. Sp. Pl. ii, 1121 (1753).
Lewiston, Nez Perces County; April and May (Nos. 1135, 1210, 1232).

Bryum cirrhatum Hoppe & Hornsch. Fl. 90 (1819).
Farmington Landing, Kootenai County; July (No. 1082).

Bryum cuspidatum Schimp. Syn. Musc. Eur. 430 (1876.)
Hope, Kootenai County; August (No. 1114).

Bryum sandbergii Holzinger, sp. nov.

Dicecious, male plants not seen; female plants 1 to 2 cm. high, glossy green, with the habit of Mnium; leaves, whether wet or dry, spreading, soft; on fertile plants in an approximate rosette near the apex, on sterile shoots less crowded, decurrent at basal angles, oblanceolate, 0.8 mm. wide at base, 1.8 mm. wide above the middle, 6.5 mm. long; perichætial leaves 0.8 mm. wide, 6 mm. long, tapering from the base, the innermost reduced to 0.4 mm. wide, 2.5 mm. long, all serrate above the middle; costa percurrent, or ceasing below the apex, like the margin of narrow cells, reddish; cells in the upper part of the leaf rhombic-hexagonal, 20 to 26 μ wide, 50 to 62 μ long; in the lower part rectangular, 14 to 16 μ wide, 65 to 90 μ long; in the margin thick-walled, 1 to 5 μ wide, of variable length, in 2 or 3 rows; seta 2 to 2.5 cm. long, glossy, dark brown; capsule brown, arcuate, ascend-

ing to pendent, 5 mm. long excluding peristome, 1 mm. in diameter, with a ring of darker-colored cells around the mouth, and constricted under the mouth when dry; collum 2 mm. long; outer peristome light-yellow, inner peristome as long, cilia 3 or 4.

The leaf areolation of this plant suggests an affinity to *Bryum ontariense*, though the latter has not so distinct a margin of narrow, *thick-walled*, colored cells. It is distinguished from that species by the absence of radicles on the stem, which is dark-colored and beset with squamose rudimentary leaves, by the larger and looser leaf cells, the leaf margin not revolute, and the less crowded rosette of leaves at the apex of the stem.

Hope, Kootenai County; August (No. 1161).

Bryum miniatum atwateriæ (C. Müll.) Ren. & Card. Musc. Amer. Sept. (1893); *B. atwateriæ* C. Müll. Regensb. Flora, 76 (1873).

Hope, Kootenai County; August (No. 1127).

Mnium marginatum (Dicks.) Beauv. Prodr. 75 (1805); *Bryum marginatum* Dicks. Pl. Crypt. fasc. 2, 9, t. 5 (1790); *Mnium serratum* Schrad. in L. Syst. Nat. ed. 13, ii, 1330 (1791).

Farmington Landing, Kootenai County; July (Nos. 1087, 1255).

Mnium medium Bruch & Schimp. Bryol. Eur. fasc. 5, 32, t. 10 (1838).

Hope, Kootenai County; August (1103).

Mnium punctatum (L.) Hedw. Fund. Musc. ii, 94 (1784); *Bryum serpyllifolium punctatum* L. Sp. Pl. ii, 1113 (1753).

Hope, Kootenai County; August (No. 1113).

Mnium spinulosum Bruch & Schimp. Bryol. Eur. fasc. 31, Suppl. iv, 4 (1846).

Lewiston, Nez Perces County; April and May (No. 1149). Farmington Landing, Kootenai County; July (No. 1130).

Mnium umbratile Mitt. Journ. Linn. Soc. viii, 30 (1865).

Hope, Kootenai County; August (No. 1105).

Leucolepis acanthoneura (Schwæg.) Lindb. Mniac. Eur. 81. (1866); *Hypnum acanthoneuron* Schwæg. Suppl Hedw. Sp. Musc. iii, pt. ii, 1, t. 258 (1827).

Farmington Landing, Kootenai County; July (No. 1075).

Aulacomnium androgynum (L.) Schwæg. Suppl. Hedw. Sp. Musc. iii, t. 215 (1827); *Mnium androgynum* L. Sp. Pl. ii, 1110 (1753).

Lewiston, Nez Perces County, April and May (Nos. 1153, 1231). Farmington Landing, Kootenai County, July (Nos. 1216, 1252, 1256).

Aulacomnium palustre Schwæg. Suppl. Hedw. Sp. Musc. iii, t. 216 (1827).

Hope, Kootenai County; August (No. 1101).

Timmia austriaca Hedw. Sp. Musc. 176, t. 42 (1801).

Lewiston, Nez Perces County; April and May (No. 1059). Farmington Landing, Kootenai County; July (Nos. 1148, 1254). Hope, Kootenai County (No. 1224).

Atrichum undulatum altecristatum Ren. & Card. Bot. Gaz. xv, 58 (1890).

Lewiston, Nez Perces County; April and May (No. 1058). Hope, Kootenai County; August (No. 1152).

Polytrichum attenuatum Menz. Trans. Linn. Soc. iv, 72, t. 6, f. 2 (1798).

Hope, Kootenai County; August (No. 1121).

Polytrichum juniperinum Willd. Fl. Ber. Prodr. 305 (1787).

Lewiston, Nez Perces County; April and May (No. 1151). Farmington Landing, Kootenai County; August (No. 1213).

Fontinalis antipyretica L. Sp. Pl. ii, 1107 (1753).

Hope, Kootenai County; August (No. 1164).

Fontinalis neo-mexicana Sull. & Lesq.; Sull. Icon. Musc. Suppl. 76, t. 57 (1874).

Hope, Kootenai County; August (No. 1165).

Dichelyma uncinatum Mitt. Journ. Linn. Soc. viii, 44 (1865).
Hope, Kootenai County; August (No. 1166).

Homalothecium nevadense (Lesq.) Ren. & Card. Bot. Gaz. xiii, 202 (1888); *Hypnum* (*Camptothecium*) *nevadense* Lesq. Mem. Cal. Acad. i, 33 (1868).
Farmington Landing, Kootenai County; July (No. 1067).

Climacium americanum Brid. Musc. Recent. Suppl. ii, 45 (1822).
Farmington Landing, Kootenai County; July (No. 1099).

Pseudoleskea atrovirens Bruch & Schimp. Bryol. Eur. t. 477 (1851–55). No. 1171 is, according to Mr. Cardot, the form of this species called by Kindberg *Pseudoleskea oligoclada*.
Hope, Kootenai County; August (Nos. 1170, 1171).

Pseudoleskea atrovirens brachyclados (Schwæg.) Schimp. Bryol. Eur. sub. t. 477 (1851–55); *Leskea brachyclados* Schwæg. in Schultes, Reise auf den Glockner, ii, 364. Description in Web. & Mohr. Bot. Tasch. 248 (1807).
Hope, Kootenai County; August (Nos. 1160, 1264).

Pseudoleskea rigescens Wils.; Lindb. Act. Soc. Sci. Fenn. x, 247 (1872).
Hope, Kootenai County; August (No. 1159).

Heterocladium aberrans Ren. & Card. Bot. Gaz. xv, 59, t. 9 (1890).
Hope, Kootenai County; August (No. 1122).

Camptothecium æneum (Mitt.) Lesq & James, Man. 331 (1884); *Hypnum æneum* Mitt. Journ. Linn. Soc. viii, 31, t. 5 (1865).
Lewiston, Nez Perces County; April and May (Nos. 1146, 1230).

Camptothecium dolosum Ren. & Card. Bot. Centralbl. No. 51 (1890).
Farmington Landing, Kootenai County; July (No. 1177).

Camptothecium lutescens (Huds.) Bruch & Schimp. Bryol. Eur. t. 558 (1851–55).
Hypnum lutescens Huds. Fl. Angl. 421 (1762).
Farmington Landing, Kootenai County; July (No. 1091).

Claopodium crispifolium (Hook.) Lesq. & James, Man. 329 (1884); *Hypnum crispifolium* Hook. Musc. Exot. t. 33 (1818), with description.
Farmington Landing, Kootenai County; July (Nos. 1057, 1248). Hope, Kootenai County; August (No. 1076).

Thamnium bigelovii (Sull.) Lesq. & James, Man. 362 (1884); *Hypnum bigelovii* Sull. Pac. R. Rep. iv, 189, t. 9 (1856).
This species is mixed with *Thamnium leibergii* both in No. 1107 and 1221.
Hope, Kootenai County; August (No. 1221).

Thamnium leibergii E. G. Britton, Bull. Torr. Club, xvi, 111 (1889).
Hope, Kootenai County, August (No. 1107).

Brachythecium albicans (Neck.) Bruch & Schimp. Bryol. Eur. t. 553 (1851–55); *Hypnum albicans* Neck. Meth. Musc. 180 (1771).
Farmington Landing, Kootenai County; July (No. 1198).

Brachythecium œdipodium Mitt. Journ. Linn. Soc. viii, 32 t. 5 (1865).
Hope, Kootenai County; August (No. 1175).

Brachythecium rivulare Bruch & Schimp. Bryol. Eur. t. 546 (1851–55).
Lewiston, Nez Perces County; April and May (No. 1176, 1229).

Brachythecium rutabulum Bruch & Schimp, Bryol. Eur. t. 543 (1851–55); *Hypnum rutabulum* L. Sp. Pl. ii, 1124 (1753).
Hope, Kootenai County; August (No. 1117).

Brachythecium salebrosum (Hoffm.) Bruch & Schimp. Bryol. Eur. t. 549 (1851–55); *Hypnum salebrosum* Hoffm. Deutsch. Fl. ii, 74, (1804).
Farmington Landing, Kootenai County; July (Nos. 1068, 1234, 1241, 1251).

Brachythecium starkei (Brid.) Bruch & Schimp. Bryol. Eur. t. 541 (1851–55); *Hypnum starkei* Brid. Musc. Recent. ii, pt. ii, 107 (1801).
Hope, Kootenai County; August (No. 1207).

Eurhynchium strigosum (Hoffm.) Bruch & Schimp. Bryol. Eur. t. 519 (1851–55); *Hypnum strigosum* Hoffm. Deutsch. Fl. ii, 76 (1804).

Lewiston, Nez Perces County; April and May (No. 1150). Farmington Landing, Kootenai County; July (Nos. 1214, 1243, 1250).

Eurhynchium strigosum barnesii Ren. & Card. Bot. Gaz, xiv, 97 (1889).

Hope, Kootenai County; August (Nos. 1172, 1222).

Eurhynchium strigosum fallax Ren. & Card. Bot. Gaz. xiv, 98 (1889).

Lewiston, Nez Perces County; April and May (No. 1173). Farmington Landing, Kootenai County; July (No. 1246).

Scleropodium obtusifolium (Hook.) Ren. & Card. Musc. Amer. Sept. 53 (1893); *Hypnum obtusifolium* Hook.; Lesq. & James, Man. 400 (1884).

Farmington Landing, Kootenai County; July (No. 1078). Hope, Kootenai County; August (No. 1261).

Plagiothecium denticulatum microcarpum Ren. & Card. Bot. Gaz. xiv, 98 (1889).

These plants are not typical of this variety.

Farmington Landing, Kootenai County; July (No. 1086). Hope, Kootenai County; August (Nos. 1106, 1123, 1158).

Plagiothecium sandbergii Ren. & Card. sp. nov.

A *P. læto* aliisque formis minoribus *P. denticulati* differt foliis latioribus brevius acuminatis vel apiculatis, magis decurrentibus, reti laxiore cellulis multo latioribus efformato, costa longiore distinctiore. Monoicum! Capsula erecta.

Hope, Kootenai County; August (No. 1174).

Plagiothecium silesiacum (Beauv.) Bruch & Schimp. Bryol. Eur. t. 500 (1851–55); *Hypnum silesiacum* Beauv. Prodr. 70 (1805).

Farmington Landing, Kootenai County, July (No. 1096).

Amblystegium hygrophilum (Juratz.) Schimp. Syn. Musc. 715 (1876); *Hypnum hygrophilum* Juratz.[1] in Müll. Westph. Laubm.

Lewiston, Nez Perces County; April and May (Nos. 1134, 1225).

Amblystegium juratzkanum Schimp. Syn. Musc. Eur. 710 (1876).

Lewiston, Nez Perces County; April and May (No. 1131).

Amblystegium orthocladon (Beauv.) Ren. & Card. Musc. Amer. Sept. 57 (1893); *Hypnum orthocladon* Beauv. Prodr. 72 (1805).

Lewiston, Nez Perces County, April and May (No. 1266).

Amblystegium serpens (L.) Bruch & Schimp. Bryol. Eur. t. 564 (1851–55); *Hypnum serpens* L. Sp. Pl. ii, 1130 (1753).

Lewiston, Nez Perces County, April and May (Nos. 1132, 1138, 1141, 1145, 1208, 1226, 1228).

Amblystegium varium (Beauv.) Lindb. Musc. Scand. 29 (1879); *Hypnum varium* Beauv. Prodr. 72 (1805).

Lewiston, Nez Perces County; April and May (No. 1064).

Hypnum capillifolium Warnst. Bot. Zeit. 1877, 478 (1877); *Hypnum fluitans capillifolium* (Warnst.) Ren. & Card. Musc. Amer. Sept. 59 (1893); *Hypnum longinerve* Kindb. Can. Musc. 230 (1892); *Dichelyma longinerve* Kindb. Bull. Torr. Club, xvi, 97 (1889).

Farmington Landing, Kootenai County; July (No. 1098).

Hypnum cordifolium Hedw. Musc. Frond. iv, 97, t. 37 (1842).

This plant was collected with *Lemna minor*, in water, and is a peculiar pinnately branching form of the species.

Granite Station, Kootenai County; July (No. 1199).

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[1] Mr. Cardot states that unfortunately the date of publication of these exsiccata is not stated either by Schimper, Bouley, or Husnot.

Hypnum hispidulum Brid. Musc. Recent. Suppl. ii, 198 (1812).

Lewiston, Nez Perces County; April and May (No. 1209). Farmington Landing, Kootenai County, July (No. 1253).

Hypnum ochraceum Turn.; Wils. Bryol. Brit. 400 (1855).

Farmington Landing, Kootenai County; July (No. 1074). Hope, Kootenai County; August (Nos. 1220, 1265).

Hypnum subimponens Lesq. Trans. Amer. Phil. Soc. xiii, 14 (1863).

Farmington Landing, Kootenai County; July (Nos. 1070, 1084, 1259). Hope, Kootenai County; August (No. 1056).

Hypnum symmetricum Ren. & Card. Bot. Gaz. xiv, 99, t. 14 (1889).

Lewiston, Nez Perces County; April and May (Nos. 1055, 1233). Farmington Landing, Kootenai County; July (Nos. 1065, 1234, 1235, 1236, 1238, 1240, 1242, 1244, 1247, 1249).

Hypnum uncinatum Hedw. Sp. Musc. 289 (1801).

Farmington Landing, Kootenai County; July (Nos. 1069, 1079, 1258).

Hylocomium loreum (L.) Bruch & Schimp. Bryol. Eur. t. 490 (1851–55); *Hypnum loreum* L. Sp. Pl. ii, 1127 (1753).

Hope, Kootenai County; August (No. 1125).

Hylocomium parietinum (L.) Lindb. Musc. Scand. 37 (1879); *Hypnum parietinum* L. Sp. Pl. ii, 1125 (1753); *Hypnum schreberi* Willd.

Farmington Landing, Kootenai County; July (No. 1217). Hope, Kootenai County; August (No. 1088).

Hylocomium proliferum (L.) Lindb. Musc. Scand. 37 (1879); *Hypnum proliferum* L. Sp. Pl. ii, 1125 (1753); *Hypnum splendens* Hedw.

Farmington Landing, Kootenai County; July (No. 1218). Hope, Kootenai County; August (No. 1089).

Hylocomium robustum (Hook.) Kindb. Enum. Bry. Exot. 18 (1888); *Hypnum robustum* Hook. Musc. Exot. t. 108, with description.

Hylocomium triquetrum (L.) Bruch & Schimp. Bryol. Eur. t. 491 1851–55); *Hypnum triquetrum* L. Sp. Pl. ii, 1124 (1753).

Lewiston, Nez Perces County; April and May (No. 1062). Farmington Landing, Kootenai County; July (No. 1090). Hope, Kootenai County; August (No. 1262).

HEPATICÆ.[1]

Hygrobiella taxifolia.

This is new to North America.

Hope, Kootenai County; August (No. 1268).

Plagiochila asplenioides.

Farmington Landing, Kootenai County; July (No. 1269).

Blepharostoma trichophyllum.

Hope, Kootenai County; August (No. 1270).

Lophocolea bidentata.

Hope, Kootenai County; August (No. 1271).

Ptilidium californicum.

Hope, Kootenai County; August (No. 1272).

FUNGI.[2]

Æcidium euphorbiæ (Schrank) Gmel. Linn. Syst. Nat. ii, 2, 1493 (1791); *Lycoperdon euphorbiæ* Schrank, Fl. Bav. ii, 631 (1789).

On *Euphorbia* sp. (No. 1184).

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[1] A few fragments of Hepaticæ, found among the mosses, were determined by L. M. Underwood.

[2] The Fungi were determined by Mr. J. B. Ellis, Newfield, N. J., and arranged by Mr. Joseph F. James, of the Division of Vegetable Physiology and Pathology, Department of Agriculture.

Æcidium hydrophylli Peck, 26th Rep. New York State Mus. Nat. Hist. 78 (1874).

On *Hydrophyllum capitatum* (No. 1183).

Æcidium ranunculacearum DC. Lam. & DC. Fl. Fran. vi, 97 (1815).

On *Delphinium scopulorum* (No. 1181).

Puccinia asperior Ellis & Everh. Bull. Washburn Lab. Nat. Hist. 3 (1884).

Æcidium form.

On *Peucedanum* sp. (No. 1190).

Puccinia mariæwilsoni Clinton, 25th Rep. N. Y. State Mus. Nat. Hist. 115 (1873); *Cæoma* (*Æcidium*) *claytoniatum* Schw. Trans. Amer. Phil. Soc. n. ser. iv, 294 (1834).

Æcidium form.

On an unidentified host (No. 1185).

Puccinia oreoselini (Strauss) Körn. Hedwigia, 1877, 2; *Uredo oreoselini* Strauss, Ann. der Wetterauschen Gesellsch. ii, 97 (1811); *Puccinia jonesii* Peck, Bot. Gaz. vi, 226 (1881).

On an umbelliferous plant (No. 1194).

Erysipheæ sp.

Pycnidial and conidial stages.

On *Hydrophyllum capitatum* (No. 1182).

Albugo candidus (Pers.) Kuntze, Rev. Gen. Pl. ii, 658 (1891); *Cystopus candidus* (Pers.) Lév. Ann. Sci. Nat. (Bot.) ser. 3, viii, 371 (1847); *Æcidium candidum* Pers.; Gmel. L. Syst. Nat. ed. 13, ii, pt. 2, 1473 (1791).

On *Barbarea barbarea* (No. 1188). On *Sisymbrium* sp. (No 1192).

Melampsora farinosa (Pers.) Schrœt. Pilze Schles. 360 (188–); *Uredo farinosa saliciscapreæ* Pers. Syn. Fung. 217 (1801).

On *Salix* sp. (No. 1196).

Melampsorella cerastii (Pers.) Schrœt. Krypt. Fl. Schles. 366 (188–); *Uredo pustulata cerastii* Pers. Syn. Fung. 219 (1801).

Uredo form.

On *Cerastium arvense* (No. 1187).

Oidium erysiphioides Fries, Syst. Mycol. iii, 432 (1829).

On *Amsinckia lycopsioides* (No. 1186).

Peronospora giliæ Ellis & Everh. sp. nov.

Hypophyllous, the interwoven hyphæ forming a loose, ashy-gray coat on the surface of the leaf. Fertile hyphæ erect, stout, 300 to 400 μ high, 8 to 10 μ thick, 3 to 4 times dichotomously divided above, the branches sending out lateral, short, horn-like, slightly recurved branchlets 10 to 15 μ long, the tips of the last bifurcation often bifid. Conidia elliptical, smooth, and colorless or nearly so, 18 to 22 $\times$ 12 to 15 μ. Oöspores globose, yellow-brown, 30 to 45 (mostly 35) μ in diameter, with a very thick epispore, coarsely subreticulate, tubercular roughened.

On *Gilia* sp. (No. 1191).

Peronospora parasitica (Pers.) Fries, Summa Veg. Scand. sect. post. 493 (1849); *Botrytis parasitica* Pers. Obs. Mycol. i, 96 (1796).

On *Erysimum asperum* (No. 1189).

Phragmidium disciflorum (Tode) James, nom. nov.; *Phragmidium subcorticium* (Schrank) Winter, Die Pilze, 228 (1884); *Lycoperdon subcorticium* Schrank in Hoppe, Bot. Taschb. 68 (1793); *Ascophora disciflora* Tode, Fungi Meckl. i, 16 (1791).

On *Rosa* sp. (No. 1195). This is the same as *Coleosporium miniatum* Bon. Coniomyc. und Cryptomyc. 17 (1860).

Septoria sisymbrii Ellis, Amer. Naturalist, xvi, 811 (1882).

On *Sisymbrium* sp. (No. 1193).

CATALOGUE OF SPECIMENS.

1. Allium cusickii Wats.
2. Phlox gracilis (Dougl.) Greene.
3. Amsinckia intermedia Fisch. & Mey.
4. Delphinium scopulorum stachydeum Gray.
5. Athysanus pusillus (Hook.) Greene.
6. Blepharipappus scaber Hook.
7. Collinsia grandiflora Dougl.
8. Thysanocarpus curvipes Hook.
9. Astragalus inflexus Dougl.
10. Cryptanthe leiocarpa (Fisch. & Mey.) Greene.
11. Thalesia uniflora (L.) Britton.
12. Agoseris hirsuta (Hook.) Greene.
13. Fritillaria pudica (Pursh) Spreng.
14. Draba nemorosa L.
15. Alsine nitens (Nutt.) Rydberg.
16. Phacelia linearis (Pursh) Holzinger.
17. Lappula texana (Scheele) Britton.
18. Microseris linearifolia (DC.) Gray.
19. Tellima parviflora (Nutt.) Hook.
20. Amsinckia lycopsoides Lehm.
21. Peucedanum circumdatum Wats.
22. Peucedanum grayi Coult. & Rose.
23. Lupinus ornatus Dougl.
24. Peucedanum salmoniflorum Coult. & Rose.
25. Phlox longifolia Nutt.
26. Amelanchier alnifolia Nutt.
27. Trillium petiolatum Pursh.
28. Peucedanum triternatum robustius Coult. & Rose.
29. Hydrophyllum capitatum Dougl.
30. Brodiæa douglasii Wats.
31. Ribes niveum Lindl.
32. Balsamorhiza sagittata (Pursh) Nutt.
33. Betula occidentalis Hook.
34. Bikukulla cucularia (L.) Millspaugh.
35. Cryptanthe leiocarpa (Fisch. & Mey.) Greene.
36. Claytonia arenicola Henderson.
37. Claytonia perfoliata Donn.
38. Collinsia parviflora Dougl.
39. Salix cordata Muhl.
40. Lithospermum pilosum Nutt.
41. Arabis hirsuta (L.) Scop.
42. Taraxacum taraxacum (L.) Karst.
43. Cratægus rivularis Nutt.
44. Equisetum hyemale L.
45. Lepidium dictyotum Gray.
46. Collomia linearis Nutt.
47. Potentilla glandulosa Lindl.
48. Erigeron compositus pinnatisectus Gray.
49. Cerastium arvense L.
50. Rumex venosus Pursh.
51. Pinus contorta Loudon.
52. Peucedanum macrocarpum Nutt.
53. Amelanchier alnifolia Nutt.
54. Selaginella rupestris Spring.
55. Valerianella congesta Lindl.
56. Populus trichocarpa Torr. & Gr.
57. Ribes aureum Pursh.
58. Erodium cicutarium L'Her.
59. Sisymbrium incisum filipes Gray.
60. Lepidium intermedium Gray.
61. Polemonium micranthum Benth.
62. Berberis aquifolium Pursh.
63. Dodecatheon sp.
64. Equisetum arvense L.
65. Vicia americana Muhl.
66. Mimulus nasutus Greene.
67. Synthyris rubra (Dougl.) DC.
68. Thermopsis montana Nutt.
69. Salix lasiandra Benth.
70. Salix cordata Muhl.
71. Salix lasiolepis Benth.
72. Camelina sativa (L.) Crantz.
73. Saxifraga integrifolia Hook.
74. Lathyrus venosus californicus Wats.
75. Mertensia oblongifolia (Nutt.) Don.
76. Castilleja parviflora Bong.
77. Nothocalais cuspidata (Pursh) Greene.
78. Alsine jamesii (Torr.) Holzinger.
79. Arabis arcuata (Nutt.) Gray.
80. Salix longifolia Muhl.
81. Acer glabrum Torr.
82. Peucedanum geyeri Wats.
83. Galium aparine L.
84. Phlox gracilis (Dougl.) Greene.
85. Celtis occidentalis pumila (Pursh) Gray.
86. Poa filifolia Vasey.
87. Plagiobothrys tenellus (Nutt.) Gray.
88. Arabis perfoliata Lam.
89. Vagnera sessilifolia (Nutt.) Greene.
90. Barbarea barbarea (L.) MacMillan.
91. Arabis retrofracta Graham.
92. Saxifraga heterantha Hook.
93. Saxifraga reflexa Hook.
94. Peucedanum salmoniflorum Coult. & Rose.
95. Ranunculus glaberrimus Hook.
96. Salix cordata Muhl.
97. Prunus demissa (Nutt.) Walp.
98. Cerastium longipedunculatum Muhl.
99. Lupinus burkei Wats.
100. Sisyrinchium grandiflorum Dougl.
101. Frasera albicaulis Griseb.

102. Blank.
103. Leptotænia multifida Nutt.
104. Carex festiva polystachya Bailey.
105. Viola howellii Gray.
106. Fragaria virginiana illinoensis Gray.
107. Geum ciliatum Pursh.
108. Osmorhiza occidentalis (Nutt.) Torr.
109. Senecio lugens exaltatus (Nutt.) Gray.
110. Platyspermum scapigerum Hook.
111. Cardamine hirsuta L.
112. Hydrophyllum virginianum L.
113. Viola obliqua Hill.
114. Zygadenus venenosus Wats.
115. Scutellaria angustifolia Pursh.
116. Equisetum robustum Al. Braun.
117. Salix cordata Muhl.
118. Salix rostrata Richards.
119. Woodsia oregana Eaton.
120. Lupinus lepidus Dougl.
121. Collomia grandiflora Dougl.
122. Thelypodium laciniatum Endl.
123. Bromus breviaristatus (Hook.) Buckl.
124. Festuca microstachys Nutt.
125. Peucedanum ambiguum Nutt.
126. Ranunculus nelsonii glabriusculus Holzinger.
127. Geum japonicum Thunb.
128. Sambucus melanocarpa Gray.
129. Salix lasiandra Benth.
130. Ribes cereum Dougl.
131. Batrachium trichophyllum (Chaix) Bossch.
132. Camassia esculenta (Ker) Lindl.
133. Alnus serrulata (Ait.) Willd.
134. Poa annua rigidiuscula Dewey.
135. Astragalus arrectus Gray.
136. Ranunculus septentrionalis Poir.
137. Prunus emarginata mollis Brewer.
138. Poa filifolia Vasey.
139. Capnoides montanum (Engelm.) Britton.
140. Geranium incisum Nutt.
141. Draba caroliniana Walt.
142. Astragalus gibbsii Kellogg.
143. Cornus stolonifera Mx.
144. Mentzelia dispersa Wats.
145. Lepidium montanum alyssoides (Gray) Jones.
146. Hordeum nodosum L.
147. Achillea millefolium L.
148. Rumex acetosella L.
149. Matricaria matricarioides (Less.) Porter.
150. Peucedanum canbyi Coult. & Rose.
151. Pentstemon rattani minor Gray.
152. Rumex salicifolius Weinm.
153. Potentilla gracilis Dougl.
154. Alsine media L.
155. Lithospermum pilosum Nutt.
156. Rhamnus purshiana DC.
157. Valerianella olitoria Poll.
158. Potentilla rivalis millegrana Engelm.
159. Myosurus apetalus Gay.
160. Hutchinsia procumbens (L.) Desv.
161. Heuchera cylindrica Dougl.
162. Equisetum arvense L.
163. Cryptanthe flaccida (Lehm.) Greene.
164. Poa sandbergii Vasey.
165. Equisetum robustum A. Braun.
166. Bromus breviaristatus (Hook.) Buckley.
167. Bromus hordeaceus L.
168. Osmorhiza nuda Torr.
169. Pentstemon glandulosus Lindl.
170. Blank.
171. Clarkia pulchella Pursh.
172. Pentstemon rattani minor Gray.
173. Rosa californica Cham. & Schlecht.
174. Phacelia circinata stricta Gray.
175. Potentilla glandulosa Lindl.
176. Parietaria pennsylvanica Muhl.
177. Allium geyeri Wats.
178. Agropyron divergens Nees.
179. Agropyron tenerum Vasey.
180. Eriophyllum cæspitosum Lindl.
181. Antennaria carpathica pulcherrima Hook.
182. Acer glabrum Torr.
183. Poa tenuifolia Nutt.
184. Myosotis verna Nutt.
185. Oenothera cæspitosa Nutt.
186. Silene menziesii Hook.
187. Poa tenuifolia Nutt.
188. Gilia aggregata (Pursh) Spreng.
189. Lupinus leucophyllus Dougl.
190. Silene antirrhina L.
191. Sedum spathulifolium Hook.
192. Monolepis nuttalliana (R. & S.) Greene.
193. Lagophylla ramosissima, Nutt.
194. Anemone tritolia L.
195. Vaccinium membranaceum Dougl
196. Calochortus elegans Pursh.
197. Arnica cordifolia Hook.
198. Disporum majus (Hook.) Britton.
199. Thalictrum occidentale Gray.
200. Synthyris reniformis (Dougl.) DC.
201. Arenaria macrophylla Hook.
202. Erythronium grandiflorum Pursh.
203. Prunus subcordata Benth.
204. Arctostaphylos uva-ursi (L.) Spreng.
205. Abies grandis Lindl.
206. Larix occidentalis Nutt.
207. Viola canina L.
208. Claytonia sibirica L.
209. Trillium ovatum Pursh.
210. Ribes oxycanthoides L.
211. Calypso bulbosa (L.) Oakes.
212. Viola glabella Nutt.
213. Viola canadensis L.
214. Viola orbiculata Geyer.
215. Salix cordata Muhl.
216. Trifolium longipes latifolium Hook.
217. Coptis occidentalis (Nutt.) Torr. & Gr.
218. Ribes viscosissimum Pursh.
219. Fragaria virginiana illinoensis Gray.
220. Frittillaria pudica (Pursh) Spreng.
221. Lonicera utahensis Wats.
222. Viola nuttallii Pursh.
223. Fragaria virginiana illinoensis Gray.
224. Carex geyeri Boott.
225. Microseris nutans (Hook.) Gray.
226. Lupinus laxiflorus Dougl.
227. Leptotænia dissecta Nutt.
228. Vagnera amplexicaulis (Nutt.) Greene.
229. Antennaria plantaginifolia (L.) Richards.
230. Juncoides campestre (L.) Kuntze.
231. Ribes lacustre Poir.
232. Mitella trifida Graham.
233. Atragene americana Sims.
234. Carex deflexa rossii (Boott) Bailey.

235. Actæa spicata rubra Ait.
236. Veronica serpyllifolia L.
237. Salix flavescens scouleriana (Barratt) Bebb.
238. Vaccinium cæspitosum Mx.
239. Frasera speciosa Dougl.
240. Valeriana edulis Nutt.
241. Eunanus nanus (Hook. & Arn.) Holzinger.
242. Phlox speciosa Pursh.
243. Ribes niveum Lindl.
244. Arnica alpina Olin.
245. Pentstemon confertus Dougl.
246. Claytonia sibirica L.
247. Wyethia amplexicaulis Nutt.
248. Balsamorhiza hookeri Nutt.
249. Cratægus tomentosa L.
250. Scrophularia marilandica L.
251. Sonchus oleraceus L.
252. Heracleum lanatum Mx.
253. Philadelphus lewisii Pursh.
254. Veronica americana Schwein.
255. Veronica peregrina L.
256. Euphorbia dictyosperma Fisch. & Mey.
257. Potentilla gracilis Dougl.
258. Allium acuminatum Hook.
259. Rubus strigosus Mx.
260. Poa tenuifolia Nutt.
261. Juncus nevadensis Wats.
262. Elymus condensatus Presl.
263. Vleckia urticifolia (Benth.) Holzinger.
264. Verbena bracteosa Mx.
265. Blank.
266. Poa nevadensis Vasey.
267. Plantago purshii Rœm. & Schult.
268. Crepis occidentalis Nutt.
269. Erigeron compositum Dougl.
270. Symphoricarpos occidentalis Hook.
271. Polygonum douglassii Greene.
272. Carduus undulatus megacephalus Gray.
273. Gaillardia aristata Pursh.
274. Opulaster opulifolius (L.) Kuntze.
275. Epilobium adenocaulon Haussk.
276. Madia sativa Molina.
277. Acer glabrum Torr.
278. Rigiopappus leptocladus Gray.
279. Geranium carolinianum longipes Wats.
280. Chrysopsis villosa hispida (Hook.) Gray.
281. Opuntia missouriensis DC.
282. Clematis ligusticifolia Nutt.
283. Sambucus glauca Nutt.
284. Pentstemon triphyllus Dougl.
285. Legouzia perfoliata (L.) Britton.
286. Lonicera utahensis Wats.
287. Polygonum convolvulus L.
288. Habenaria dilatata (Pursh) Hook.
289. Circæa pacifica Ascherson & Magnus.
290. Panicularia remota (Fors.)Kuntze.
291. Festuca myurus L.
292. Cyperus houghtonii Torr.
293. Stipa comata Trin. & Rupr.
294. Erigeron concinnus (Hook. & Arn.) Gra
295. Carex straminea festucacea(Willd.) Ducke...
296. Panicum scoparium Lam.
297. Agropyron divergens Nees.
298. Roripa nasturtium (L.) Rusby.
299. Spiræa betulifolia Pallas.
300. Rubus nutkanus Moçino.
301. Psoralea lanceolata Pursh.
302. Sphæralcea munroana (Dougl.) Spach.
303. Crepis acuminata Nutt.
304. Collomia grandiflora Dougl.
305. Poa nevadensis Vasey.
306. Eriogonum heracleoides Nutt.
307. Pentstemon venustus Dougl.
308. Thalesia fasciculata (Nutt.) Britton.
309. Sanguisorba annua (Nutt.) Holzinger.
310. Trifolium microcephalum Pursh.
311. Linum digynum Gray.
312. Juncus bufonius L.
313. Antennaria luzuloides Torr. & Gr.
314. Vicia americana truncata Nutt.
315. Iris missouriensis Nutt.
316. Potentilla glandulosa Lindl.
317. Sisyrinchium bermudiana L.
318. Orthocarpus luteus Nutt.
319. Zygadenus venenosus Wats.
320. Clematis douglasii Hook.
321. Helianthus douglasii Torr. & Gr.
322. Galium boreale L.
323. Deschampsia calycina Presl.
324. Agoseris elata (Nutt.) Greene.
325. Arnica alpina Olin.
326. Crepis acuminata Nutt.
327. Woodsia oregana Eaton.
328. Caucalis microcarpa Hook. & Arn.
329. Gnaphalium palustre Nutt.
330. Juncus xiphioides triandrus Engelm.
331. Bromus breviaristatus (Hook.) Buckley.
332. Ranunculus septentrionalis Poir.
333. Koeleria cristata (L.) Pers.
334. Trifolium altissimum Dougl.
335. Symphoricarpos occidentalis Hook.
336. Mimulus moschatus Dougl.
337. Campanula rotundifolia L.
338. Erigeron macranthus Nutt.
339. Antennaria plantaginifolia (L.) Richards.
340. Roripa curvisiliqua (Hook.) Bessey.
341. Pentstemon confertus procerus (Dougl.) Coville.
342. Silene multicaulis Nutt.
343. Senecio vulgaris L.
344. Calochortus elegans Pursh.
345. Geum strictum Ait.
346. Trifolium cyathiferum Lindl.
347. Mimulus rubellus Gray.
348. Blank.
349. Alsine borealis (Bigel.) Britton.
350. Veronica serpyllifolia L.
351. Cryptanthe leiocarpa (Fisch. & Mey.) Greene.
352. Rhamnus californica Esch.
353. Elymus glaucus Buckl.
354. Poa nevadensis Vasey.
355. Allium serratum Wats.
356. Panicularia pauciflora (Presl.) Kuntze.
357. Carex festiva Dew.
358. Panicularia nervata (Willd.) Kuntze.
359. Carex stipata Muhl.
360. Panicularia nervata (Willd.) Kuntze.
361. Alsine longipes (Goldie) Coville.
362. Lathyrus palustris nanus Holzinger.
363. Senecio lugens Richards.
364. Rumex occidentalis Wats.
365. Cryptanthe pterocarya (Torr.) Greene.

366. Prunella vulgaris L.
367. Carex straminea festucacea(Willd.)Tuckerm.
368. Gratiola virginiana L.
369. Trisetum cernuum Trin.
370. Hordeum pusillum Nutt.
371. Microseris nutans (Hook.) Gray.
372. Apocynum androsæmifolium pumilum Gray.
373. Blank.
374. Deschampsia elongata (Hook.) Munro.
375. Poa nevadensis Vasey.
376. Urtica gracilis Ait.
377. Cratægus rivularis Nutt.
378. Aconitum fischeri Reich.
379. Juncus tenuis Willd.
380. Mitella trifida Graham.
381. Rosa blanda Ait.
382. Agropyron divergens Nees.
383. Lathyru palustris L.
384. Cypripedium montanum Dougl.
385. Rosa gymnocarpa Nutt.
386. Ribes oxyacanthoides L.
387. Melica subulata (Griseb.) Scribner.
388. Festuca ovina polyphylla Vasey, ined.
389. Antennaria dioica (L.) Gært.
390. Lonicera ciliosa (Pursh) Poir.
391. Sida malvæflora DC.
392. Panicularia nervata (Willd.) Kuntze.
393. Angelica lyallii Wats.
394. Festuca jonesii Vasey.
395. Carduus drummondii (Torr. & Gr.) Coville.
396. Alopecurus californicus Vasey.
397. Epilobium halleanum Haussk.
398. Claytonia chamissoi Ledeb.
399. Arenaria lateriflora L.
400. Polygonum bistortoides Pursh.
401. Ranunculus reptans intermedius (Hook.) Torr. & Gr.
402. Lotus pinnatus Hook.
403. Blank.
404. Blank.
405. Juncus nevadensis Wats.
406. Penstemon confertus Dougl.
407. Marsilia vestita Hook.
408. Tissa rubra (L.) Britton.
409. Epilobium ursinum Parish.
410. Alsine longifolia (Muhl.) Britton.
411. Polygonum imbricatum Wats.
412. Lathyrus sandbergii Holzinger.
413. Vicia americana Muhl.
414. Ceanothus sanguineus Pursh.
415. Alopecurus californicus Vasey.
416. Galium trifidum L.
417. Carex exsiccata Bailey.
418. Ranunculus alismæfolius Geyer.
419. Deschampsia cæspitosa (L.) Beauv.
420. Mertensia paniculata (Ait.) Don.
421. Sorbus sambucifolia (Cham. & Schlecht.) Rœm.
422. Antennaria racemosa Hook.
423. Epilobium minutum Lindl.
424. Gentiana acuta Mx.
425. Clintonia uniflora (Menz.) Kunth.
426. Castilleja miniata Dougl.
427. Alnus incana virescens Wats.
428. Pachystima myrsinites (Pursh) Raf.
429. Microseris nutans (Hook.) Gray.
430. Gratiola ebracteata Benth.
431. Veronica scutellata L.
432. Saxifraga integrifolia Hook.
433. Deschampsia cæspitosa (L.) Beauv.
434. Bromus breviaristatus (Hook.) Buckley.
435. Graphephorum wolfii Vasey.
436. Juncus balticus Willd.
437. Poa pratensis L.
438. Trisetum canescens Buckley.
439. Deschampsia elongata (Hook.) Munro.
440. Trisetum canescens Buckley.
441. Linnæa borealis L.
442. Trautvetteria carolinensis (Walt.) Vail.
443. Adenocaulon bicolor Hook.
444. Mimulus moschatus Dougl.
445. Micromeria douglasii Benth.
472. Blank.
447. Madia filipes Gray.
448. Carex athrostachya Olney.
449. Carex filiformis latifolia Bœckl.
450. Castilleja acuminata (Pursh) Spreng.
451. Festuca ovina L.
452. Carex pratensis Drejer.
453. Danthonia californica unispicata Thurb.
454. Tiarella unfoliata Hook.
455. Orthocarpus tenuifolius Benth.
456. Asarum caudatum Lindl.
457. Juncus nevadensis Wats.
458. Listera convallarioides (Sw.) Torr.
459. Dryopteris munita (Kaulf.) Kuntze
460. Corallorhiza striata Lindl.
461. Ranunculus nelsoni Gray.
462. Moneses uniflora (L.) Gray.
463. Cornus canadensis L.
464. Alnus incana virescens Wats.
465. Blank.
466. Pentstemon menziesii Hook.
467. Pellæa densa Hook.
468. Antennaria margaritacea (L.) Hook.
469. Menziesia glabella Gray.
470. Streptopus amplexifolius (L.) DC.
471. Habenaria gracilis (Lindl.) Wats.
472. Blank.
473. Ceanothus velutinus Dougl.
474. Polygonum douglasii Greene.
475. Astragalus mortoni Nutt.
476. Danthonia californica Boland.
477. Epilobium paniculatum Nutt.
478. Arenaria congesta Nutt.
479. Blank.
480. Plantago lanceolata L.
481. Agropyron divergens Nees.
482. Bromus brizæformis Fisch. & Mey.
483. Hordeum jubatum L.
484. Eleocharis acicularis (L.) Rœm & Schult.
485. Corallorhiza corallorhiza (L.) Karst.
486. Pedicularis racemosa Dougl.
487. Alsine longipes (Goldie) Coville.
488. Agoseris laciniata (Nutt.) Greene.
489. Carduus remotifolius Hook.
490. Gilia liniflora pharnaceoides (Benth.) Gray.
491. Marrubium vulgare L.
492. Gilia aggregata (Pursh) Spreng.
493. Hordeum nodosum L.
494. Onobrychis sativa Lam.
495. Centaurea cyanus L.

496. Blank.
497. Gaillardia pulchella Foug.
498. Blank.
499. Comandra pallida DC.
500. Cheilanthes gracilima Eaton.
501. Ceanothus velutinus lævigatus Torr. & Gr.
502. Carex nebraskensis prævia Bailey.
503. Poa tenuifolia Nutt.
504. Festuca oregona Vasey.
505. Poa nevadensis Vasey.
506. Blank.
507. Berberis nervosa Pursh.
508. Fragaria sp.
509. Hieracium albiflorum Hook.
510. Brodiæa lactea (Lindl.) Wats.
511. Trichostema oblongum Benth.
512. Hypericum formosum scouleri (Hook.) Coult.
513. Betula occidentalis Hook.
514. Cerastium longipedunculatum Muhl.
515. Poa pratensis L.
516. Pterospora andromedea Nutt.
517. Frittillaria lanceolata Pursh.
518. Carex deweyana sparsiflora (Olney) Bailey.
519. Chimaphila umbellata (L.) Nutt.
520. Pyrola secunda L.
521. Pyrola chlorantha Swartz.
522. Pyrola rotundifolia bracteata (Hook.) Gray.
523. Bromus ciliatus L.
524. Senecio triangularis Hook.
525. Galium triflorum Mx.
526. Clarkia rhomboidea Dougl.
527. Alsine crispa (Cham. & Schlect.) Holzinger.
528. Carex teretiuscula ampla Bailey.
529. Gilia capitata Dougl.
530. Festuca scabrella major Vasey.
531. Bromus secalinus L.
532. Calochortus elegans Pursh.
533. Linum lewisii Pursh.
534. Poa compressa L.
535. Ligusticum scopulorum Gray.
536. Bolelia elegans (Dougl.) Greene.
537. Spiræa douglasii menziesii (Hook.) Presl.
538. Spiræa douglasii menziesii (Hook.) Presl.
539. Spiræa betulifolia Pall.
540. Panicularia nervata (Willd.) Kuntze.
541. Trisetum cernuum Trin.
542. Festuca jonesii Vasey.
543. Poa flava L.
544. Festuca rubra longearistata Hack. ined.
545. Poa nemoralis L.
546. Poa pratensis L.
547. Agrostis scabra Willd.
549. Madia filipes Gray.
550. Aster conspicuus Lindl.
551. Lotus douglasii Greene.
552. Corallorhiza multiflora Nutt.
553. Mitella caulescens Nutt.
554. Juncoides parviflorum (Ehrh.) Coville.
555. Blank.
556. Agropyron violaceum major Vasey.
557. Erigeron ramosus (Walt.) B. S. P.
558. Erysimum asperum DC.
559. Agropyron divergens Nees.
560. Hieracium scouleri Hook.
561. Calamagrostis canadensis (Mx.) Beauv.
562. Sphæralcea acerifolia Nutt.
563. Phalaris arundinacea L.
564. Calamagrostis suksdorfii Scribner.
565. Angelica lyallii Wats.
566. Rhamnus alnifolia L Her.
567. Carex retrorsa Schwein.
568. Carex festiva Dew.
569. Artemisia gnaphalodes Nutt.
570. Rubus ursinus Cham & Schlect.
571. Elymus glaucus Buckl.
572. Rosa sandbergii Holzinger.
573. Hieracium canadense Mx.
574. Hieracium scouleri Hook.
575. Opulaster capitatus (Pursh) Kuntze.
576. Rhamnus purshiana DC.
577. Lupinus polyphyllus Lindl.
578. Calamagrostis canadensis (Mx.) Beauv.
579. Deschampsia cæspitosa (L.) Beauv.
580. Steironema ciliatum (L.) Raf.
581. Rosa blanda Ait.
582. Bromus ciliatus L.
583. Spiræa ariæfolia Smith.
584. Habenaria elegans (Lindl.) Boland.
585. Gilia heterophylla Dougl.
586. Eunanus sp.
587. Valeriana sylvatica Banks.
588. Xerophyllum tenax (Pursh) Nutt.
589. Arenaria capillaris Poir.
590. Lonicera utahensis Wats.
591. Polemonium cæruleum L.
592. Pedicularis contorta Benth.
593. Juncus parryi Engelm.
594. Cryptogramme acrostichoides R. Br.
595. Thlaspi alpestre L.
596. Peucedanum bicolor Wats.
597. Lonicera involucrata Banks.
598. Scutellaria galericulata L.
599. Bromus ciliatus L.
600. Galium trifidum L.
601. Arabis spathulata Nutt.
602. Dodecatheon dentatum Hook.
603. Blank.
604. Calochortus elegans Pursh.
605. Phegopteris dryopteris robertiana (Hoffm.) Davenp.
606. Carex geyeri Boott.
607. Viola howellii Gray.
608. Alsine jamesii (Torr.) Holzinger.
609. Senecio lugens Richards.
610. Carex preslii Steud.
611. Lathyrus nevadensis Wats.
612. Trientalis europæa latifolia (Hook.) Torr.
613. Juncoides glabratum (Hoppe) Sheldon.
614. Solidago missouriensis Nutt.
615. Lotus americanus (Nutt.) Bisch.
616. Panicum pubescens Lam.
617. Coreopsis atkinsoniana Dougl.
618. Blank.
619. Rosa gymnocarpa Nutt.
620. Woodsia scopulina Eaton.
621. Nymphæa advena Soland.
622. Blank.
623. Orobanche pinetorum Geyer.
624. Navarretia intertexta Hook.
625. Aster foliaceus Lindl.
626. Abies grandis Lindl.
627. Pinus contorta Loudon.

628. Erigeron corymbosus Nutt.
629. Tsuga mertensiana (Bong.) Carriere.
630. Calamagrostis cusickii Vasey.
631. Pyrola elliptica Nutt.
632. Poa flava L.
633. Agoseris grandiflora (Nutt.) Greene.
634. Carex aperta Hook.
635. Gnaphalium decurrens Ives.
636. Panicularia pauciflora (Presl) Kuntze.
637. Calamagrostis canadensis dubia (Scribner) Vasey.
638. Carex stipata Muhl.
639. Stachys palustris L.
640. Madia sativa Molina.
641. Scutellaria lateriflora L.
642. Verbascum blattaria L.
643. Panicum pubescens Lam.
644. Poa flava L.
645. Batrachium aquatile (L.) Wimm.
646. Agrostis exarata Trin.
647. Gnaphalium palustre Nutt.
648. Carex scoparia Schk.
649. Eleocharis ovata (Roth.) Roem. & Schult.
650. Pentstemon deustus Dougl.
651. Mentzelia lævicaulis (Dougl.) Torr. & Gr.
652. Gayophytum ramosissimum Torr. & Gr.
653. Chænactis douglasii (Hook.) Hook. & Arn.
654. Lagophylla ramossima Nutt.
655. Phacelia magellanica (Lam.) Coville.
656. Epilobium paniculatum Nutt.
657. Berberis aquifolium Pursh.
658. Ptiloria tenuifolia (Torr.) Raf.
659. Peucedanum ambiguum Nutt.
660. Calochortus macrocarpus Dougl.
661. Dryopteris filix-mas (L.) Schott.
662. Polygonum alpinum All.
663. Pyrola aphylla Smith.
664. Chrysopsis villosa hispida (Hook.) Gray.
665. Erigeron concinnus (Hook. & Arn.) Gray.
666. Ranunculus septentrionalis Poir.
667. Vicia americana truncata Nutt.
668. Senecio canus Hook.
669. Silene scouleri Hook.
670. Panicularia fluitans (L.) Kuntze.
671. Solidago elongata Nutt.
672. Aster stenomeres Gray.
673. Pentstemon menziesii Hook.
674. Pyrola picta Smith.
675. Blank.
676. Cephalanthera oregana Reichenb.
677. Eriogonum umbellatum Torr.
678. Pyrola picta Smith.
679. Peramium menziesii (Lindl.) Morong.
680. Vaccinium ovalifolium Smith.
681. Erigeron speciosus DC.
682. Calamagrostis suksdorfii Scribner.
683. Festuca oregona Vasey.
684. Juncus nevadensis Wats.
685. Eleocharis palustris (L.) Roem. & Schult.
686. Cicuta virosa maculata (L.) Coult. & Rose.
687. Scirpus lacustris occidentalis Wats.
688. Potentilla palustris (L.) Scop.
689. Polygonum amphibium L.
690. Ranunculus reptans L.
691. Spartina cynosuroides (L.) Willd.
692. Juncus filiformis L.
693. Carex interrupta impressa Bailey.
694. Calamagrostis canadensis (Mx.) Beauv.
695. Chenopodium album L.
696. Madia glomerata Hook.
697. Potamogeton pulcher Tuckerm.
698. Mentha canadensis L.
699. Howellia aquatilis Gray.
700. Sparganium simplex angustifolium (Mx.) Engelm.
701. Nymphæa polysepala (Engelm.) Greene
702. Panicularia fluitans (L.) Kuntze.
703. Festuca oregona Vasey.
704. Agropyron repens glaucum (Desf.) Scribner.
705. Erigeron acris L.
706. Lactuca spicata (Lam.) Hitchcock.
707. Blank.
708. Tsuga mertensiana (Bong.) Carriere.
709. Sambucus lacustre Poir.
710. Ribes lacustre Poir.
711. Polygonum amphibium L.
712. Heterocodon rariflorum Nutt.
713. Panicum capillare minus Muhl.
714. Agropyrum tenerum Vasey.
715. Sparganium simplex Hudson.
716. Carex athrostachya Olney.
717. Onagra biennis (L.) Scop.
718. Poa remota Fors.
719. Cyperus aristatus Rottb.
720. Rumex occidentalis Wats.
721. Carex filiformis latifolia Bœckl.
722. Lysichiton kamtschatcensis (L.) Schott.
723. Asplenium filix-fœmina cyclosorum Rupr.
724. Cinna pendula glomerula Scribner.
725. Gentiana oregana Engelm.
726. Helianthus annuus L.
727. Lycopus virginicus L.
728. Solidago serotina Ait.
729. Ranunculus lacustris terrestris (Gray) MacMillan.
730. Solidago serotina Ait.
731. Erigeron canadensis L.
732. Ranunculus pennsylvanicus L. f.
733. Sium cicutæfolium Gmelin.
734. Mentha canadensis L.
735. Lysimachia thyrsiflora L.
736. Polygonum lapathifolium L.
737. Epilobium franciscanum Barbey.
738. Impatiens aurea Muhl.
739. Typha latifolia L.
740. Alsine longifolia (Muhl.) Britton.
741. Veratrum californicum Durand.
742. Cleome serrulata Pursh.
743. Lilium parviflorum (Hook.) Holzinger.
744. Razoumofskya douglasii (Engelm.) Kuntze.
745. Allium attenuifolium Kellogg.
746. Epilobium hornemanni Reichenb.
747. Eriogonum ovalifolium Nutt.
748. Hedysarum flavescens Coult. & Fish.
749. Coleosanthus grandiflorus (Hook.) Kuntze.
750. Adiantum pedatum L.
751. Carex capillaris L.
752. Chrysopsis villosa hispida (Hook.) Gray.
753. Arnica latifolia Bong.
754. Artemisia gnaphalodes Nutt.
755. Saxifraga bronchialis L.
756. Stenanthium occidentale Gray.

757. Pentstemon lyallii Gray.
758. Woodsia scopulina Eaton.
759. Aster sibiricus L.
760. Botrychium virginianum (L.) Sw.
761. Carex amplexifolia Boott.
762. Botrychium marilandica L.
763. Sanicula marilandica L.
764. Aster modestus Lindl.
765. Capnoides montanum (Engelm.) Britton.
766. Erysimum cheiranthoides L.
767. Habenaria orbiculata (Pursh) Torr.
768. Rudbeckia occidentalis Nutt.
769. Calamagrostis suksdorfii Scribner.
770. Lycopodium complanatum L.
771. Lycopodium annotinum L.
772. Aralia nudicaulis L.
773. Carduus foliosus Hook.
774. Carex retrorsa Schwein.
775. Chenopodium botrys L.
776. Juncus nodosus L.
777. Dulichium arundinaceum (L.) Britton.
778. Rumex maritimus L.
779. Solanum nigrum L.
780. Utricularia vulgaris L.
781. Scirpus subterminalis Torr.
782. Brasenia purpurea (Mx.) Casp.
783. Gnaphalium sprengelii Hook. & Arn.
784. Grindelia nana Nutt.
785. Pyrrocoma carthamoides Hook.
786. Dracocephalum parviflorum Nutt.
787. Razoumofskya sp.
788. Carex utriculata minor Boott.
789. Cicuta bulbifera L.
790. Triglochin palustris L.
791. Polemonium humile pulchellum (Bunge) Gray.
792. Hypericum formosum scouleri (Hook.) Coult.
793. Viola palustris L.
794. Rubus arcticus L.
795. Dryopteris cristata (L.) Gray.
796. Betula pumila L.
797. Gyrostachys romanzoffiana (Cham.) MacMillan.
798. Carex tenella Schk.
799. Dryopteris spinulosa dilatata (Hoffm.) Underwood.
800. Carex leptalea Wahl.
801. Lemna minor L.
802. Epilobium lineare Muhl.
803. Senecio aureus L.
804. Aster adscendens Lindl.
805. Tussilago sagittata Banks.
806. Equisetum hyemale L.
807. Polygonum hartwrightii Gray.
808. Melampyrum americanum Mx.
809. Carex limosa L.
810. Drosera rotundifolia L.
811. Carex pseudo-cyperus americana Hochst.
812. Castalia leibergii Morong.
813. Sambucus glauca Nutt.
814. Carex canescens brunescens (Pers.) Poir.
815. Asclepias speciosa Torr.
816. Astragalus microcystis Gray.
817. Monarda fistulosa mollis (L.) Benth.
818. Chamnærion angustifolium (L.) Scop.
819. Trisetum subspicatum (L.) Beauv.
820. Carex deflexa meadia Bailey.
821. Pyrola rotundifolia incarnata DC.
822. Artemisia gnaphalodes Nutt.
823. Carum gairdneri (Hook. & Arn.) Gray.
824. Juniperus virginiana L.
825. Apocynum cannabinum L.
826. Glycyrrhiza lepidota Pursh.
827. Melica subulata (Griseb.) Scribner.
828. Menyanthes trifoliata L.
829. Vaccinium myrtillus L.
830. Juniperus nana Willd.
831. Festuca viridula Vasey.
832. Blank.
833. Oxyria digyna (L.) Hill.
834. Saxifraga leucanthemifolia Mx.
835. Hieracium gracile detonsum Gray.
836. Sibbaldia procumbens L.
837. Mitella pentandra Hook.
838. Blank.
839. Aster engelmanni (Eaton) Gray.
840. Aquilegia flavescens Wats.
841. Carex deflexa media Bailey.
842. Ranunculus affinis R. Br.
843. Mitella breweri Gray.
844. Epilobium anagallidifolium Lam.
845. Osmorhiza nuda Torr.
846. Hypopitys multiflora Scop.
847. Erigeron acris debillis Gray.
848. Trisetum subspicatum (L.) Beauv.
849. Claytonia parvifolia Moçino.
850. Carex pyrenaica Wahl.
851. Polygonum minimum Wats.
852. Arabis platysperma Gray.
853. Dryopteris lonchitis (L.) Kuntze.
854. Eriogonum flavum Nutt.
855. Epilobium anagallidifolium Lam.
856. Cardamine leibergii Holzinger.
857. Sambucus melanocarpa Gray.
858. Phegopteris alpestris (Swartz) Mett.
859. Rubus strigosus Mx.
860. Sedum roseum (L.) Scop.
861. Habenaria gracilis (Lindl.) Wats.
862. Agoseris aurantiaca (Hook.) Greene.
863. Veratrum viride Ait.
864. Urtica lyallii Wats.
865. Alsine uliginosa (Murr.) Britton.
866. Blank.
867. Echinopanax horridum (Smith) Dec. & Planch.
868. Aster fremonti (Torr. & Gr.) Gray.
869. Physostegia parviflora Nutt.
870. Lepargyræa canadensis (L.) Greene.
871. Rosa californica Cham. & Schlecht.
872. Gnaphalium microcephalum Nutt.
873. Dryopteris filix-mas (L.) Schott.
874. Dryopteris spinulosa intermedia (Muhl.) Underwood.
875. Listera cordata (L.) R. Br.
876. Panicularia nervata (Willd.) Kuntze.
877. Aster fremonti (Torr. & Gr.) Gray.
878. Agrostis exarata asperifolia (Trin.) Thurb.
879. Saussurea americana Eaton.
880. Juncus filiformis L.
881. Scirpus microcarpus Presl.
882. Batrachium trichophyllum (Chaix) Bossch.
883. Agrostis exarata Trin.

884. Actæa spicata arguta Torr.
885. Blank.
886. Taxus brevifolia Nutt.
887. Prenanthes alata sagittata Gray.
888. Rubus pedatus Smith.
889. Angelica dawsonii Wats.
890. Senecio serra Hook.
891. Carex reynoldsii Dew.
892. Razoumofskya americana (Engelm.) Gray.
893. Blank.
894. Centunculus minimus L.
895. Rhus glabra L.
896. Asclepias mexicana Cav.
897. Portulaca oleracea L.
898. Euphorbia serpyllifolia Pers.
899. Mollugo verticillata L.
900. Blank.
901. Marsilia vestita Hook. & Grev.
902. Artemisia gnaphalodes Nutt.
903. Eriogonum niveum Dougl.
904. Navarretia intertexta Hook.
905. Boisduvallia stricta (Gray) Greene.
906. Aristida fasciculata fendleriana (Steud.) Vasey.
907. Cleome lutea Hook.
908. Artemisia dracunculoides Pursh.
909. Solidago occidentalis Nutt.
910. Xanthium canadense (Herm.) Mill.
911. Coleosanthus oblongifolius (Nutt.) Kuntze.
912. Aster canescens Pursh.
913. Bigelovia graveolens glabrata Gray.
914. Bidens frondosa L.
915. Erigeron filifolius Nutt.
916. Antennaria geyeri Gray.
917. Aster multiflorus Ait.
918. Verbascum thapsus L.
919. Iva xanthifolia Nutt.
920. Polypogon monspeliensis (L.) Desf.
921. Delphinium scopulorum Gray.
922. Boisduvallia densiflora (Lindl.) Wats.
923. Trifolium pauciflorum Nutt.
924. Senecio hydrophilus Nutt.
925. Razoumofskya occidentalis (Engelm.) Kuntze.
926. Mimulus pulsiferæ Gray.
927. Medicago sativa L.
928. Lappula lappula (L.) Karst.
929. Linum digynum Gray.
930. Tetradymia canescens DC.
931. Carex flava recte-rostrata Bailey.
932. Blank.
933. Carex interrupta impressa Bailey.
934. Batrachium trichophyllum (Chaix) Bossch.
935. Alisma plantago L.
936. Gilia capillaris Kellogg.
937. Potentilla anserina L.
938. Senecio hydrophilus Nutt.
939. Potamogeton natans L.
940. Monotropa uniflora L.
941. Sagittaria latifolia Willd.
942. Bolelia elegans (Dougl.) Greene.
943. Pteris aquilina lanuginosa Bong.
944. Convolvulus sepium L.
945. Deschampsia cæspitosa (L.) Beauv.
946. Triglochin maritima L.
947. Alopecurus geniculatus fulvus (Smith) Scribner.
948. Panicum pubescens Lam.
949. Juncus nevadensis Wats.
950. Juncus alpinus insignis Fries.
951. Juncus balticus Willd.
952. Symphoricarpos occidentalis Hook.
953. Aster lævis L.
954. Potamogeton pectinatus L.
955. Potamogeton heterophyllus longipedunculatus (Merat) Morong.
956. Potamogeton perfoliatus richardsonii Bennett.
957. Aster adscendens Lindl.
958. Hordeum nodosum L.
959. Equisetum limosum L.
960. Polygonum pennsylvanicum L.
961. Amaranthus retroflexus L.
962. Amaranthus albus L.
963. Rhus radicans L.
964. Carduus undulatus Nutt.
965. Blank.
966. Polygonum aviculare L.
967. Thuya plicata Lamb.
968. Polygonum douglasii Greene.
969. Physalis lanceolata Mx.
970. Epipactis gigantea Dougl.
971. Verbascum blattaria L.
972. Verbena bracteosa Mx.
973. Rosa fendleri Crepin.
974. Rosa pisocarpa Gray.
975. Artemisia dracunculoides Pursh.
976. Erigeron ramosus beyrichii (Fisch. & Mey.) Smith & Pound.
977. Prunus demissa (Nutt.) Walp.
978. Salix longifolia Muhl.
979. Erigeron divergens Torr. & Gr.
980. Aster fremonti (Torr. & Gr.) Gray.
981. Artemisia frigida Willd.
982. Elymus canadensis L.
983. Nepeta cataria L.
984. Artemisia trifida Nutt.
985. Solanum triflorum Nutt.
986. Stipa viridula Trin.
987. Amaranthus blitoides Wats.
988. Blank.
989. Cyrtorhyncha cymbalaria (Pursh) Britton.
990. Rudbeckia laciniata L.
991. Grindelia squarrosa (Pursh) Dunal.
992. Bigelovia graveolens albicaulis Gray.
993. Gutierrezia euthamiæ (Nutt.) Torr. & Gr.
994. Bigelovia douglasii Gray.
995. Solidago radula Nutt.
996. Eriogonum annuum Nutt.
997. Eriogonum multiceps Nees.
998. Aster incanopilosus (Lindl.) Sheldon.
999. Calamovilfa longifolia (Hook.) Hack.
1000. Eriocarpum spinulosum (Pursh) Greene.
1001. Solidago radula Nutt.
1002. Eriogonum cernuum Nutt.
1003. Lygodesmia juncea (Pursh) Don.
1004. Aster canescens Pursh.
1005. Dysodia papposa (Vent.) Hitchcock.
1006. Gærtneria acanthicarpa (Hook.) Britton.
1007. Bigelovia graveolens (Nutt.) Gray.
1008. Rhus trilobata Nutt.
1009. Rosa fendleri Crepin.
1010. Artemisia trifida Nutt.

1011. Artemisia longifolia Nutt.
1012. Polanisia trachysperma Torr. & Gr.
1013. Corispermum hyssopifolium L.
1014. Artemisia longifolia Nutt.
1015. Iva axillaris Pursh.
1016. Abronia fragrans Nutt.
1017. Aster tenacetifolius H. B. K.
1018. Atriplex patula L.
1019. Lepargyræa argentea (Pursh) Greene.
1020. Lacinaria punctata (Hook.) Kuntze.
1021. Aster incanopilosus (Lindl.) Sheldon.
1022. Helenium autumnale L.
1023. Allium schœnoprasum L.
1024. Betula occidentalis Hook.
1025 Rumex salicifolius Weinm.
1026. Potamogeton heterophyllus longipedunculatus (Merat) Morong.
1027. Salvia carnosa Dougl.
1028. Trifolium involucratum Willd.
1029. Roripa palustris (L.) Bess.
1030. Pentstemon confertus Lindl.
1031. Ambrosia psilostachya DC.
1032. Cratægus tomentosa L.
1033. Mentzelia ornata (Pursh) Torr.
1034. Suæda depressa (Pursh) Wats.
1035. Sisymbrium officinale Scop.
1036. Grindelia nana Nutt.
1037. Astragalus spaldingii Gray.
1038. Disporum trachycarpum (Wats.) Benth & Hook.
1039. Habenaria unalascensis (Spreng.) Wats.
1040. Claytonia caroliniana sessilifolia Torr.
1041. Lupinus flexuosus Lindl.
1042. Opulaster monogynus (Torr.) Kuntze.
1043. Blank.
1044. Amaranthus californica (Moq.) Wats.
1045. Salix lasiandra lancifolia (Anders.) Bebb.
1046. Blank.
1047. Cystopteris fragilis (L.) Bernh.
1048. Blank.
1049. Polemonium humile Willd.
1050. Chimaphila menziesii (R. Br.) Spreng.
1051. Poa flava L.
1052. Scirpus nanus Spreng.
1053. Pedicularis bracteosa Benth.
1054. Blank.
1055. Hypnum symmetricum Ren. & Card.
1056. Hypnum subimponens Lesq.
1057. Claopodium crispifolium (Hook.) Lesq. & James.
1058. Atrichum undulatum altecristatum Ren. & Card.
1059. Timmia austriaca Hedw.
1060. Orthotrichum speciosum Nees.
1061. Dicranum strictum Schleich.
1062. Hylocomium triquetrum L.
1063. Ceratodon purpureus (L.) Brid.
1064. Amblystegium varium (Beauv.) Lindb.
1065. Hypnum symmetricum Ren. & Card.
1066. Barbula mülleri Bruch & Schimp.
1067. Homalothecium nevadense (Lesq.) Ren. & Card.
1068. Brachythecium salebrosum (Hoff.) Bruch & Schimp.
1069. Hypnum uncinatum Ren. & Card.
1070. Hypnum subimponens Lesq.
1071. Rhacomitrium occidentale Ren. & Card.
1072. Dicranum scoparium (L.) Hedw.
1073. Polytrichum juniperinum Willd.
1074. Hypnum ochraceum Turn.
1075. Leucolepis acanthoneura (Schwæg.) Lindb.
1076. Claopodium crispifolium (Hook.) Lesq. & James.
1077. Grimmia alpestris Schleich.
1078. Scleropodium obtusifolium (Hook.) Ren. & Card.
1079. Hypnum uncinatum Hedw.
1080. Blank.
1081. Orthotrichum speciosum Nees.
1082. Bryum cirrhatum Hoppe & Hornsch.
1083. Sphagnum squarrosum spectabile Russ.
1084. Hypnum subimponens Lesq.
1085. Bartramia menziesii Turn.
1086. Plagiothecium denticulatum microcarpum Ren. & Card.
1087. Mnium marginatum (Dicks.) Beauv.
1088. Hylocomium parietinum (L.) Lindb.
1089. Hylocomium proliferum (L.) Lindb.
1090. Hylocomium triquetrum (L.) Bruch & Schimp.
1091. Camptothecium lutescens (Huds.) Bruch & Schimp.
1092. Bartramia pomiformis crispa (Sw.) Schimp.
1093. Dicranoweisia contermina Ren. & Card.
1094. Rhacomitrium patens (Dicks.) Hüb.
1095. Gymnostomum curvirostre (Ehrh.) Hedw.
1096. Plagiothecium silesiacum (Beauv.) Schimp.
1097. Tetraphis pellucida Hedw.
1098. Hypnum capillifolium Warnst.
1099. Climacium americanum Brid.
1100. Meesia longiseta Hedw.
1101. Aulacomnium palustre Schwæg.
1102. Orthotrichum fastigiatum Bruch.
1103. Mnium medium Bruch & Schimp.
1104. Dicranum starkei Web. & Mohr.
1105. Mnium umbratile Mitt.
1106. Plagiothecium denticulatum microcarpum Ren. & Card.
1107. Thamnium leibergii E. G. Britton.
1108. Blank.
1109. Dicranum howellii Ren. & Card.
1110. Dichodontium pellucidum (L.) Schimp.
1111. Amphoridium lapponicum (Hedw.) Schimp.
1112. Hylocomium robustum (Hook.) Kindb.
1113. Mnium punctatum Hedw.
1114. Bryum cuspidatum Schimp.
1115. Philonotis fontana (L.) Brid.
1116. Bartramia ithyphylla Brid.
1117. Brachythecium rutabulum (L.) Schimp.
1118. Dicranella crispa (Ehrh.) Schimp.
1119. Ditrichum montanum Leiberg.
1120. Dicranella crispa (Ehrh.) Schimp.
1121. Polytrichum attenuatum Menz.
1122. Heterocladium aberrans Ren. & Card.
1123. Plagiothecium denticulatum microcarpum Ren. & Card.
1124. Blank.
1125. Hylocomium squarrosum (L.) Bruch & Schimp.
1126. Scouleria aquatica Hook.
1127. Bryum miniatum atwateriæ (C. Müll.) Ren. & Card.

1128. Blank.
1129. Webera cruda (L.) Schwæg.
1130. Mnium spinulosum Bruch & Schimp.
1131. Amblystegium juratzkanum Schimp.
1132. Amblystegium serpens (L.) Bruch & Schimp.
1133. Orthotrichum rœllii Vent.
1134. Amblystegium hygrophilum (Juratz.) Schimp.
1135. Bryum cæspitosum L.
1136. Ceratodon purpureus (L.) Brid.
1137. Funaria hygrometrica (L.) Hedw.
1138. Amblystegium serpens (L.) Bruch & Schimp
1139. Grimmia leucophæa Grev.
1140. Orthotrichum rœllii Vent.
1141. Amblystegium serpens (L.) Bruch & Schimp.
1142. Orthotrichum tenellum Bruch.
1143. Blank.
1144. Leptobryum pyriforme (L.) Schimp.
1145. Amblystegium serpens (L.) Bruch & Schimp.
1146. Camptothecium æneum (Mitt.) Lesq.
1147. Pottia cavifolia Ehrh.
1148. Timmia austriaca Hedw.
1149. Mnium spinulosum Bruch & Schimp.
1150. Eurynchium strigosum (Hoff.) Bruch & Schimp.
1151. Polytrichum juniperum Willd.
1152. Atrichum undulatum altecristatum Ren. & Card.
1153. Aulacomnium androgynum (L.) Schwæg.
1154. Barbula mucronifolia (Brid.) Bruch & Schimp.
1155. Orthotrichum holzingeri Ren. & Card.
1156. Webera nutans (Schreb.) Hedw.
1157. Webera cruda (L.) Schwæg.
1158. Plagiothecium denticulatum microcarpum Ren. & Card.
1159. Pseudoleskea rigescens Wils.
1160. Pseudoleskea atrovirens brachyclados (Schwæg.) Schimp.
1161. Bryum sandbergii Holzinger.
1162. Blank.
1163. Rhacomitrium sudeticum (Funck) Bruch & Schimp.
1164. Fontinalis antipyretica L.
1165. Fontinalis neo-mexicana Sull. & Lesq.
1166. Dichelyma uncinatum Mitt.
1167. Dicranoweisia contermina Ren. & Card.
1168. Rhacomitrium occidentale Ren. & Card.
1169. Grimmia pachyphylla Leiberg.
1170. Pseudoleskea atrovirens Schimp.
1171. Pseudoleskea atrovirens Schimp.
1172. Eurhynchium strigosum barnesii Ren. & Card.
1173. Eurhynchium strigosum fallax Ren. & Card.
1174. Plagiothecium sandbergii Ren. & Card.
1175. Brachythecium œdipodium Mitt.
1176. Brachythecium rivulare Bruch & Schimp.
1177. Camptothecium dolosum Ren. & Card.
1178. Grimmia apocarpa Hedw.
1179. Bartramia pomiformis crispa (Sw.) Schimp.
1180. Blank.
1181. Æcidium ranunculacearum DC.
1182. Erysipheæ sp.
1183. Æcidium hydrophylli Peck.
1184. Æcidium euphorbiæ (Schrank) Gmel.
1185. Puccinia mariæwilsoni Clinton.
1186. Oidium erysiphioides Fries.
1187. Melampsorella cerastii (Pers.) Schrœt.
1188. Albugo candidus (Pers.) Kuntze.
1189. Peronospora parasitica (Pers.) Fries.
1190. Puccinia asperior Ellis & Everh.
1191. Peronospora giliæ Ellis & Everh.
1192. Albugo candidus (Pers.) Kuntze.
1193. Septoria sisymbrii Ellis.
1194. Puccinia oreoselini (Strauss) Kœrn.
1195. Phragmidium discitlorum (Tode) James.
1196. Melampsora farinosa (Pers.) Schrœt.
1197. Barbula mulleri Bruch & Schimp.
1198. Brachythecium albicans (Neck.) Bruch & Schimp.
1199. Hypnum cordifolium Hedw.
1200. Amphoridium lapponicum (Hedw.) Schimp.
1201. Webera nutans (Schreb.) Hedw.
1202. Dicranum scoparium (L.) Hedw.
1203. Dicranum scoparium (L.) Hedw.
1204. Dicranum fuscescens Turn.
1205. Dicranum strictum Schleich.
1206. Webera commutata Schimp.
1207. Brachythecium starkei (Brid.) Bruch & Schimp.
1208. Amblystegium serpens (L.) Bruch & Schimp.
1209. Hypnum hispidulum Brid.
1210. Bryum cæspiticium L.
1211. Ceratodon purpureus (L.) Brid.
1212. Funaria hygrometrica (L.) Hedw.
1213. Polytrichum juniperinum Willd.
1214. Eurhynchium strigosum (Hoff.) Bruch & Schimp.
1215. Blank.
1216. Aulacomnium androgynum (L.) Schwæg.
1217. Hylocomium parietinum (L.) Lindb.
1218. Hylocomium proliferum (L.) Lindb.
1219. Dicranoweisia contermina Ren. & Card.
1220. Hypnum ochraceum Turn.
1221. Thamnium bigelovii (Sull.) Lesq. & James.
1222. Eurhynchium strigosum barnesii Ren. & Card.
1223. Philonotis fontana (L.) Brid.
1224. Timmia austriaca Hedw.
1225. Amblystegium hygrophilum (Juratz.) Schimp.
1226. Amblystegium serpens (L.) Bruch & Schimp.
1227. Leptobryum pyriforme (L.) Schimp.
1228. Amblystegium serpens (L.) Bruch & Schimp.
1229. Brachythecium rivulare Bruch & Schimp.
1230. Camptothecium æneum (Mitt.) Lesq.
1231. Aulacomnium androgynum (L.) Schwæg.
1232. Bryum cæspiticium L
1233. Hypnum symmetricum Ren. & Card.
1234. Hypnum symmetricum Ren. & Card.
1235. Hypnum symmetricum Ren. & Card.
1236. Hypnum symmetricum Ren. & Card.
1237. Barbula mülleri Bruch & Schimp.
1238. Hypnum symmetricum Ren. & Card.
1239. Brachythecium salebrosum (Hoff.) Bruch & Schimp.

1240. Hypnum symmetricum Ren. & Card.
1241. Brachythecium salebrosum (Hoff.) Bruch & Schimp.
1242. Hypnum symmetricum Ren. & Card.
1243. Eurhynchium strigosum (Hoff.) Bruch & Schimp.
1244. Hypnum symmetricum Ren. & Card.
1245. Barbula mülleri Bruch & Schimp.
1246. Eurhynchium strigosum fallax Ren. & Card.
1247. Hypnum symmetricum Ren. & Card.
1248. Claopodium crispifolium (Hook.) Lesq. & James.
1249. Hypnum symmetricum Ren. & Card.
1250. Eurhynchium strigosum (Hoff.) Bruch & Schimp.
1251. Brachythecium salebrosum (Hoff.) Bruch & Schimp.
1252. Aulacomnium androgynum (L.) Schwæg.
1253. Hypnum hispidulum Brid.
1254. Timmia austriaca Hedw.
1255. Mnium marginatum (Dicks.) Beauv.
1256. Aulacomnium androgynum (L.) Schwæg.
1257. Webera cruda (L.) Schwæg.
1258. Hypnum uncinatum Hedw.
1259. Hypnum subimponens Lesq.
1260. Dicranum strictum Schleich.
1261. Scleropodium obtusifolium (Hook.) Ren. & Card.
1262. Hylocomium triquetrum (L.) Bruch & Schimp.
1263. Blank.
1264. Pseudoleskea atrovirens brachyclados (Schwæg.) Schimp.
1265. Hypnum ochraceum Turn.
1266. Amblystegium orthocladon (Beauv.) Ren. & Card.
1267. Blank.
1268. Hygrobiella laxifolia Spruce.
1269. Plagiochila asplenioides (L.) Nees & Mont.
1270. Blepharostoma trichostomum (L.) Dum.
1271. Lophocolea bidentata (L.) Dum.
1272. Ptilidium californicum (Aust.) Pearson.

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U. S. DEPARTMENT OF AGRICULTURE.
DIVISION OF BOTANY.

CONTRIBUTIONS

FROM

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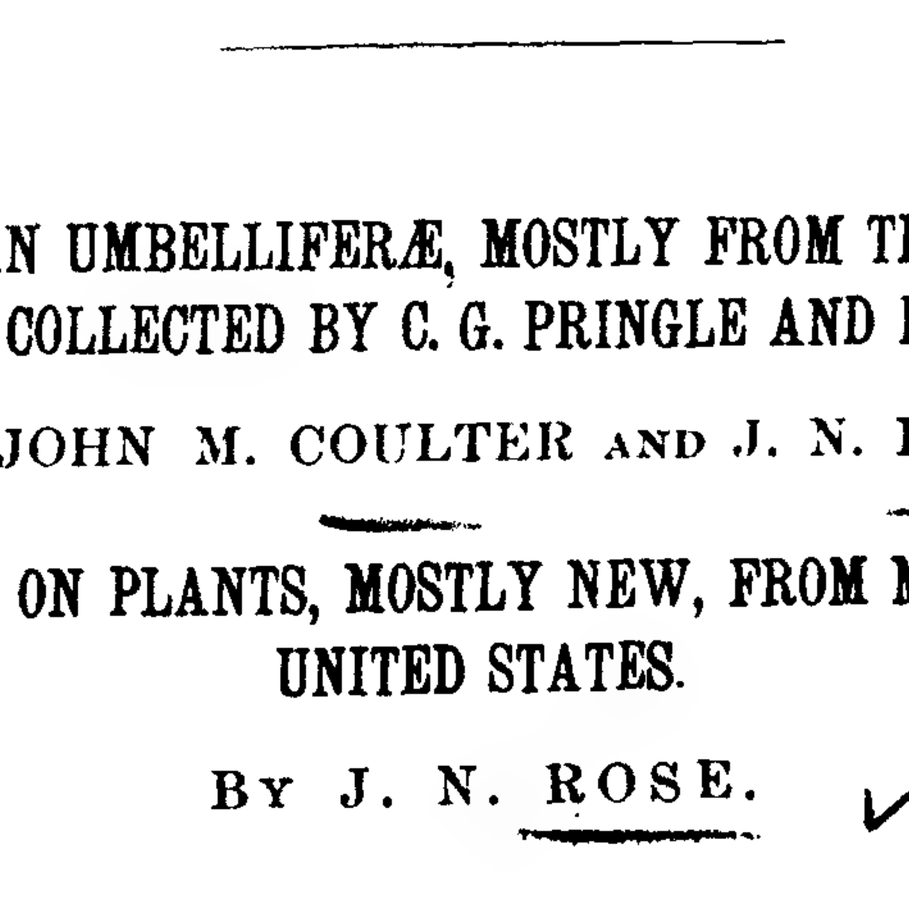
REPORT ON MEXICAN UMBELLIFERÆ, MOSTLY FROM THE STATE OF OAXACA, RECENTLY COLLECTED BY C. G. PRINGLE AND E. W. NELSON.

By JOHN M. COULTER and J. N. ROSE.

DESCRIPTIONS ON PLANTS, MOSTLY NEW, FROM MEXICO AND THE UNITED STATES.

By J. N. ROSE.



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LETTER OF TRANSMITTAL.

UNITED STATES DEPARTMENT OF AGRICULTURE,
DIVISION OF BOTANY,
Washington, D. C., July 30, 1895.

SIR: I have the honor to transmit herewith for publication Volume III, No. 5, Contributions from the United States National Herbarium.

Respectfully,

FREDERICK V. COVILLE,
Botanist.

Hon. J. STERLING MORTON,
Secretary of Agriculture.

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REPORT ON MEXICAN UMBELLIFERÆ, MOSTLY FROM THE STATE OF OAXACA, RECENTLY COLLECTED BY C. G. PRINGLE AND E. W. NELSON.

By JOHN M. COULTER and J. N. ROSE.

HISTORY OF COLLECTIONS.

The collections of Umbelliferæ herein reported are the largest and most important ever brought from Mexico. We had looked forward with considerable interest to the results that should be obtained by Mr. Pringle and Mr. Nelson in the State of Oaxaca, and had urged the importance of collecting the species previously reported from this State. A number of rare species are known only from this region, and it is practically unrepresented in our herbaria. The National Herbarium contained but a single umbellifer from Oaxaca. In order that these collectors might obtain fresh specimens of the old species, as complete data as possible as to descriptions and stations were furnished. The care and diligence that they have shown are clearly brought out by the results here published. Not only have they collected nearly all the species previously obtained, but they have enabled us to establish 4 new genera and 27 new species. The number of Umbelliferæ which had previously been collected in the State of Oaxaca is very small. Hemsley, who has brought together the only compact list, enumerates in the Biologia Centrali-Americana 15 species, and 5 of these are determined only generically. Below we give a list of these species, as named by Mr. Hemsley, with the locality and collector.

Umbelliferæ collected in the State of Oaxaca previous to the year 1894.

Name of species.	Collector and number.	Habitat.
Apium graveolens[1] L	Galeotti, 2756	Cordillera of Oaxaca, at 5,000 feet.
Arracacia decumbens Benth	Galeotti, 2750	Woods at 7,000 to 8,000 feet in the Cordillera of Oaxaca.
Arracacia sp	Andrieux, 352	On Mount San Felipe, near Oaxaca.
Carum sp	Andrieux, 355	Around Oaxaca.
Eryngium carlinæ Delar	Ghiesbreght	Oaxaca.
Eryngium ghiesbreghtii Delar	Ghiesbreght	Oaxaca.
Eryngium longirameum Turcz	Galeotti, 2769	Cordillera of Oaxaca, at 7,000 to 8,000 feet.
Eryngium scaposum Turcz		Oaxaca, at 9,000 feet.
Eryngium sp	Galeotti, 2767	Woods on the Pacific coast of Oaxaca, at 7,000 feet.
Micropleura renifolia Lag	Galeotti, 2752	Woods on the mountains of the Pacific coast of Oaxaca, 6,000 to 7,000 feet.
Osmorrhiza brevistylis DC	Galeotti, 2751	Cordillera of Oaxaca, at 9,000 feet.
Peucedanum sp	Andrieux, 355	Oaxaca.
Sium angustifolium L	Galeotti, 2757	Cordillera of Oaxaca, at 7,500 feet.
Tauschia coulteri Gray	Galeotti, 2760	Woods at 7,000 to 9,000 feet.
Tauschia sp	Ghiesbreght	Near Oaxaca.

[1] Mr. Hemsley informs me in a recent letter that Galeotti's plant is a very distinct variety. It was not collected by Mr. Pringle or Mr. Nelson.—J. N. R.

The following list represents the remarkably full collections of Messrs. Pringle and Nelson:

Umbelliferæ collected in the State of Oaxaca during the year 1894.

Name of species.	Pringle's numbers.	Nelson's numbers.
Ammi visnaga (L.) Lam	4855	----------
Angelica nelsoni Coult. & Rose, sp. nov	4496	1405
Apium ammi Urban	5546	17
Arracacia bracteata Coult. & Rose, sp. nov	4675	----------
Arracacia brevipes Coult. & Rose, sp. nov	5545	1097
Arracacia filiformis Coult. & Rose, sp. nov	4714	621, 1088
Arracacia nelsoni Coult. & Rose, sp. nov	----------	1382
Arracacia ovata Coult. & Rose, sp. nov	----------	2223
Arracacia pringlei Coult. & Rose, sp. nov	4844	----------
Arracacia vaginata Coult. & Rose, sp. nov	6008	----------
Berula erecta (Huds.) Coville	5544	1567
Daucus montanus Mart. & Koch	4884	571
Deanea nudicaulis Coult. & Rose	4663	1087
Eryngium alternatum Coult. & Rose, sp. nov	----------	2248
Eryngium beecheyanum Hook. & Arn	5543	1565
Eryngium bromeliæfolium Delar	5540, 6038, 6045	620, 1129, 1182, 1739
Eryngium deppeanum Schlecht. & Cham	5548	1453, 2119
Eryngium ghiesbreghtii Decaisne	4746	2061
Eryngium involucratum Coult. & Rose, sp. nov	4747	----------
Eryngium longirameum Turcz	4910	607, 1007, 1366, 2083, 2213
Eryngium montanum Coult. & Rose, sp. nov	6040	1386
Eryngium nelsoni Coult. & Rose, sp. nov	----------	927, 1011
Eryngium scaposum Turcz	4834, 5538	1091, 1747
Fœniculum fœniculum (L.) Karst	----------	1934
Hydrocotyle bonariensis Lam	5551, 6036	760, 864, 1624, 1751, 2084
Micropleura renifolia Lag	4664	588, 746, 1019
Museniopsis cordata Coult. & Rose, sp. nov	5548, 5549	1418, 1900*b*, 2088
Museniopsis dissecta Coult. & Rose, sp. nov	----------	2062, 2091*a*, 2242
Museniopsis peucedanoides (H. B. K.) Coult. & Rose	5543	1190
Museniopsis scabrella Coult. & Rose, sp. nov	5550	1900
Museniopsis serrata Coult. & Rose, sp. nov	4868, 5542	1539, 1900*a*, 2241
Neogoezia gracilipes Hemsley	4997	----------
Neogoezia minor Hemsley	4725	1418*a*
Neonelsonia ovata Coult. & Rose, gen. et sp. nov	6007	1385
Coaxana purpurea Coult. & Rose, gen. et sp. nov	----------	646
Œnanthe pringlei Coult. & Rose, sp. nov	6009	----------
Ottoa œnanthoides H. B. K	4644	643, 664, 1119, 1734
Osmorrhiza mexicana Griesb	5547	1383
Prionosciadium megacarpum Coult. & Rose, sp. nov	4688	----------
Rhodosciadium dissectum Coult. & Rose, sp. nov	4764	----------
Rhodosciadium glaucum Coult. & Rose, sp. nov	4823, 5539, 5541	1434, 1711
Rhodosciadium glaucum lineare Coult. & Rose, var. nov	----------	1189, 1193

STATIONS.

The following is a list of the stations at which Umbelliferæ were collected by Mr. Pringle and Mr. Nelson. They are arranged according to the number of species collected, and an alphabetical list of those from each station is given. The remarks upon the localities are made up from the notes of Messrs. Pringle and Nelson, condensed or given in full.

SIERRA DE SAN FELIPE.

The Sierra de San Felipe, or the Cerro San Felipe, proved to be by far the richest source of Umbelliferæ. Twenty-three species represented by thirty-two numbers were obtained. Both Mr. Pringle and Mr. Nelson collected largely here.

Mr. Nelson writes as follows of these mountains:

The highest peak of these mountains is the Cerro San Felipe proper, which has an altitude of from 10,500 to 11,000 feet, and is distant some 12 miles from the city of

Oaxaca. Mr. Pringle seems to have collected here frequently throughout the season (May to December). I spent some ten days here (August 20 to September 1), establishing two camps near the top of the mountains, from which I made frequent excursions.

La Parada, a small Indian ranch on the north slope of the mountains, was one of the places at which Mr. Nelson camped. Its altitude is about 8,000 feet, and it is distant some 6 or 7 miles from the top of the divide, which has an altitude of 9,200 feet. The immediate region about La Parada is dry. Mr. Nelson was here August 18 to 20. He writes further:

The Cerro San Felipe is a high mountain mass situated from 8 to 10 miles north of the city of Oaxaca. It lies in an angle formed by the meeting of two arms of the valley of Oaxaca, one coming down from the north and the other from the east and meeting near the city. Bordering the east side of the northern arm of the valley is a range of oak and pine covered mountains rising from 8,000 to 10,000 feet high and having a north and south direction. This range ends by forming a series of culminating points rising to about 11,000 feet just north of Oaxaca. With this mountain group as an axis the range turns abruptly to a southeasterly course and extends thence to its junction with the cordillera of the east near the Cerro de Santa Margarita, south of Mount Zempoaltepec. Although the Cerro San Felipe is visited by frequent heavy rainstorms during the summer and the tops of the mountains are cloud-capped for days at a time, yet streams are few and small about its slopes, and springs are scarce on the summit. The slopes of the mountain are steep on all sides, but a broad, rolling area is found above 9,500 feet. This area is cut by the heads of numerous canyons and from it rise the several culminating peaks. This is a forested area with small, park-like meadows here and there.

Most of the species were collected at high altitudes: only one as low as 7,000 feet, eleven at 7,500 feet, and most of the remainder from 10,000 feet to the summit.

Species.	Altitude (feet).	Species.	Altitude (feet).
Apium ammi	7,500	*Eryngium scaposum*	9,500 to 11,000
Arracacia bracteata	9,000	*Micropleura renifolia*	7,500 to 8,500
Arracacia brevipes	10,000	*Museniopsis cordata*	9,500
Arracacia filiformis	9,500 to 11,000	*Museniopsis peucedanoides*	9,500
Arracacia pringlei	10,300	*Museniopsis scabrella*	7,000
Berula erecta	7,500	*Museniopsis tuberosa*	7,500
Daucus montanus	7,500	*Neogoezia minor*	9,000 to 10,500
Deanea nudicaulis	7,500 to 10,000	*Osmorrhiza mexicana*	10,000
Eryngium bromeliæfolia	10,000	*Ottoa œnanthoides*	10,000
Eryngium deppeanum	7,500	*Prionosciadium megacarpum*	7,500
Eryngium ghiesbreghtii	7,500	*Rhodosciadium glaucum*	6,000
Eryngium involucratum	10,000		
Eryngium longirameum	7,500 to 8,500		
Eryngium nelsoni	7,500 to 8,500		

SIERRA DE CLAVELLINAS.

The mountains bordering the valley of Oaxaca on the west are called the Sierra de Clavellinas. They run in a north and south direction and have an altitude of 6,500 to 9,500 feet. These mountains proved to be very interesting collecting ground, especially the small meadows near the top. Mr. Pringle writes thus of his work here:

The cold spring meadows on the summit of the mountains west of Oaxaca are narrow openings in heavy forests of oaks and pines, scarcely a mile in extent. One would

have to travel far, I feel sure, to find others of similar character, as it was here that Mr. Nelson and I found *Angelica nelsoni*, *Eryngium montanum*, *Œnanthe pringlei*, and other new species. We may infer that they are extremely local in their habits. *Neonelsonia ovata* and *Arracacia vaginata* grow in the moist woods on the borders of these grassy openings and find congenial situations here and there throughout that range.

Mr. Pringle collected his Umbelliferæ here in October, all at an altitude of 9,000 feet. Mr. Nelson spent ten days (September 10 to 20) in the highest part of the mountains. His camp was located in one of the high meadows mentioned above, at an altitude of about 9,300 feet. Two species are from the foothills. His camp was about 18 miles southwest of the city of Oaxaca.

The following species were collected here:

Species.	Altitude (feet).	Species.	Altitude (feet).
Angelica nelsoni	9,000	*Eryngium montanum*	9,000
Arracacia nelsoni	7,500 to 9,500	*Neogoezia gracilipes*	5,500 to 7,500
Arracacia vaginata	9,000	*Neonelsonia ovata*	7,500 to 9,500
Eryngium deppeanum	5,500 to 7,500	*Œnanthe pringlei*	9,000
Eryngium longirameum	7,500	*Osmorrhiza mexicana*	10,000

MOUNT ZEMPOALTEPEC.

This peak is situated some 50 miles east of the city of Oaxaca and is the culminating point of a high ridge, mostly of 7,000 to 9,000 feet altitude, running north and south. Mr. Nelson thinks its altitude is about 11,400 feet, although it is generally given as 13,100 feet. The main peak is rocky and covered with pines. Mr. Nelson spent eight days collecting upon the slopes and peaks of this mountain. Seven species of Umbelliferæ, represented by eight numbers, were collected. Mr. Pringle did not visit this region.

The following species were collected here:

Species.	Altitude (feet).	Species.	Altitude (feet).
Arracacia filiformis	11,400	*Micropleura renifolia*	7,700 to 8,000
Daucus montanus	7,700 to 8,000	*Coaxana purpurea*	10,000 to 11,000
Eryngium bromeliæfolium	11,400	*Ottoa œnanthoides*	8,000 to 11,000
Eryngium longirameum	7,700 to 8,000		

CUICATLAN.

The town of Cuicatlan is located in the bottom of the valley of Cuicatlan, at an altitude of only 1,800 feet. The neighboring region is extremely arid and the vegetation is very scanty. Two species of Hydrocotyle were obtained by Mr. Nelson. On the high mountain ridge to the west three other species were collected.

The following species were here obtained, of which Mr. Pringle collected *Hydrocotyle bonariensis*.

Species.	Altitude (feet).	Species.	Altitude (feet).
Hydrocotyle bonariensis..	1,800 to 2,500	*Museniopsis scabrella* ...	7,500 to 8,000
Hydrocotyle mexicana....	1,800 to 2,500	*Museniopsis tuberosa*....	7,500 to 8,000
Museniopsis cordata.....	7,500 to 8,000		

REYES.

The town of Reyes is situated on the west side of the Sierra de Reyes which border the valley of Cuicatlan. It is about 10 miles northeast of the town of Cuicatlan, at an altitude of 6,700 feet. The Sierra de Reyes runs in a north and south direction. The slopes both on the east and west are very steep. The divide above Reyes is 9,400 feet altitude. The highest peak of this range is the Volcan Negro, whose altitude is 10,400 feet.

The following species were collected here:

Species.	Altitude (feet).	Species.	Altitude (feet).
Eryngium bromeliæfolia..	10,000	*Museniopsis cordata*.....	8,000
Eryngium scaposum.....	7,500 to 10,400	*Oltoa anathoides*	7,500 to 10,000
Hydrocotyle mexicana....	8,000	*Rhodosciadium glaucum*.	6,000 to 7,500

TLAPANCINGO AND VICINITY.

The town of Tlapancingo is situated about 6 miles from the western border of Oaxaca. Its altitude is 5,200 feet above the sea. On the east side rises a mountain range to the height of 9,000 feet in the vicinity of the town, farther south becoming even higher, but toward the north lower. This region is very dry and the vegetation much stunted. In the higher parts of the mountains more rain falls and the vegetation is more luxuriant. Two trips were made by Mr. Nelson into the mountains. All the Umbelliferæ obtained were from the mountains about the town. Mr. Nelson was in this region from December 6 to 9, 1894.

The following species were collected:

Species.	Altitude (feet).	Species.	Altitude (feet).
Eryngium ghiesbreghtii...	6,000 to 8,000	*Museniopsis dissecta*	6,000 to 8,000
Eryngium longirameum ..	6,000 to 8,000	*Neogoezia gracilipes*	6,000 to 8,000
Hydrocotyle mexicana....	6,000 to 8,000		

LAS SEDAS.

Las Sedas is located near the north end of the valley of Oaxaca. This is a small railroad station at the lowest pass of the continental divide, where the road from Puebla City enters the valley of Oaxaca

and runs to the city of Oaxaca. Its distance from the latter place is about 30 miles. Its altitude is about 6,400 feet. Mr. Nelson and Mr. Pringle each collected two species here. Mr. Pringle visited the place in August and Mr. Nelson in October.

The following were the species collected:

Species.	Altitude (feet).	Species.	Altitude (feet).
Berula erecta	6,800 to 7,800	*Museniopsis serrata*	
Eryngium beecheyanum	6,000 to 7,800	*Rhodosciadium dissectum*	6,000

MINOR STATIONS.

Mr. Nelson collected *Hydrocotyle mexicana* and *Spananthe paniculata* about Choapam. The town of Choapam is situated in the extreme northeastern part of Oaxaca. Its altitude is only 2,800 feet. The climate is tropical. Mr. Nelson was here from July 26 to 29. Mr. Nelson also collected two species at Totontepec, viz, *Hydrocotyle mexicana* and *Micropleura renifolia.* The town of Totontepec is situated on the east slope of the mountain of which Zempoaltepec is the highest peak. The altitude of the town is 6,000 feet.

Mr. Nelson collected *Eryngium nelsoni* in the mountains above Yalalag. This is a large Indian town. Its altitude is about 3,800 feet, and it lies near the base of the mountains of which Zempoaltepec is the highest peak.

Mr. Pringle collected *Neogoezia gracilipes* at Santa Inez del Norte; *Arracacia trifida* at Sierra de las Cruces; *Museniopsis serrata* and *Eryngium longirameum* at Cruesta de San Juan del Estado.

Besides the above stations in the State of Oaxaca Mr. Nelson collected Umbelliferæ in the States of Guerrero, Puebla, and Vera Cruz, and Mr. Pringle a few in the States of Mexico and Vera Cruz.

CATALOGUE OF SPECIES.

The material afforded by these collections has warranted the establishment of four new genera, viz, Coaxana, Deanea, Neogoezia, and Neonelsonia, of which the first and last are here first published. It has also necessitated a revision and enlargement of Museniopsis. The list includes some species additional to those named above.

Ammi visnaga (L.) Lam. Fl. Fr. iii, 462 (1778); *Daucus visnaga* L. Sp. Pl. i, 242 (1753).

Collected by Mr. C. G. Pringle in cultivated fields in valley of Oaxaca, near Etla, altitude 5,400 feet, September 13, 1894 (No. 4855).

This is the first time, so far as we know, that this plant has been obtained in Mexico. It has been reported only a few times from the United States, and then on ballast ground.

Angelica nelsoni Coult. & Rose, sp. nov.

Evidently a tall, branching perennial, more or less pubescent; leaves large, 3 to4 times ternate; leaflets lanceolate, 3.7 to 6.2 cm. long, 12 to 20 mm. broad, generally rounded at base, simply and sharply serrate, rather long-pointed; peduncles axillary

and terminal, either elongated or nearly wanting; rays numerous (25 to 35), the longer ones about 5 cm. long; involucre wanting, or of a few linear bracts; involucel bractlets filiform; flowers white; fruit oval, 3 mm. in diameter; dorsal and intermediate ribs slightly winged, lateral wings thin; oil-tubes solitary in the intervals, 4 on the commissural side; stylopodium conical; seed indented beneath the oil-tubes and with a flat face.

Collected by F. W. Nelson, September 10 to 20, 1894 (No. 1405), and by Mr. C. G. Pringle in wet meadows of Sierra de Clavellinas, altitude 9,000 feet, October 16, 1894 (No. 4996). Much like *A. seatoni*, but with larger leaves, smaller leaflets, more numerous rays, smaller fruit, etc.

Here also should be referred Bourgeau's No. 2677, fide Hemsley in lit.

The two following species, although closely related to the above, appear to be distinct:

Angelica seatoni Coult. & Rose, sp. nov.

Leaves twice ternate or somewhat pinnate; leaflets ovate, 3.7 to 6.2 cm. long, rather long-pointed, somewhat tapering at base, especially the terminal ones, sharply serrate, slightly pubescent on the veins; peduncles axillary and terminal; rays rather numerous (15 to 20), the longer ones 5 cm. long; pedicels numerous, 12 mm. long, more or less pubescent, as also the rays and peduncle; involucre none; bractlets of the involucels filiform; flowers probably white; fruit oblong, 5 mm. long, 4 mm. broad; wings about as broad as body, thick and corky; dorsal and intermediate ribs prominent; oil-tubes solitary in the intervals or two in the lateral ones, 4 on the commissural side; stylopodium conical; seed indented beneath the oil-tubes and with a flat face.

Collected by Mr. Henry Seaton on Mount Orizaba, Mexico, July 29, 1891 (No. 65), and distributed as *Angelica mexicana* Vatke.

This species differs from *A. nelsoni* in having more simple leaves, broader leaflets, few rays, and larger fruit with thicker wings.

Here we would refer Botteri's specimens from this region. That in the Gray herbarium is No. 83, while the specimen Mr. Hemsley refers to in Biol. Centr.-Amer. i, 567 is No. 870. This latter number is probably wrong, as C. Wright's MS. list of Botteri's collection, now in the National Herbarium, refers it to a Eupatorium.

Angelica pringlei Coult & Rose, sp. nov.

Rather low, 6 to 9 dm. high; leaves 2 to 3 times ternate; leaflets ovate, 2.5 to 5 cm. long, doubly serrate, mostly rounded or truncate at base, slightly pubescent on the veins, the lateral distinctly petioled; rays of the umbel 25 to 30, 3.7 to 6.2 cm. long; pedicels 3 to 6 mm. long; flowers pinkish or white; fruit oval, 4 mm. in diameter; wings a little broader than body, thin; dorsal and intermediate ribs prominent; stylopodium low, depressed; oil-tubes solitary in the intervals or 2 in the lateral, 4 on the commissural side; seed strongly indented beneath the oil-tubes, with a broad, shallow, concave face.

Collected by C. G. Pringle along streams, Sierra de las Cruces, State of Mexico, September 11, 1892 (No. 5209).

This species differs from *A. nelsoni* in being of lower stature, with broader and somewhat doubly serrate leaflets and fewer rays.

Apium ammi (Jacq.) Urban, Fl. Bras. xi, pt. 1, 341, t. 91 (1879); *Sison ammi* Jacq. Hort. Vindob. ii, t. 200 (1772); *Apium leptophyllum* F. Muell.

Collected by C. G. Pringle on the Sierra de San Felipe, altitude 7,500 feet, September 11, 1894 (No. 5546); also collected by E. W. Nelson at Orizaba, January 28, 1894 (No. 17); and by Mr. C. G. Pringle in Baranca near Guadalajara, Jalisco, July 10, 1894 (No. 5552).

Arracacia bracteata Coult. & Rose, sp. nov.

Perennial; stems 9 to 12 dm. high, glabrous and glaucous; radical leaves from 3 to 4 times ternate, with long petioles; leaflets ovate, acute, 2.5 to 5 cm. long, ser-

rate, the terminal leaflet mostly with wedge-shaped base; stem leaves somewhat similar, 2 or 3 times ternate; leaflets often larger, somewhat oblique at base; petiole short with a broad sheath, scarious throughout; peduncles stout, very variable in length, 3 dm. long or less, sometimes wanting; involucre a simple or 3-lobed leaf; involucels of a few green linear or lanceolate bracts much longer than the fruit; rays very variable, 5 to 10 cm. long; pedicels 4 mm. long; flowers yellowish-purple(?); fruit broadly ovate, 6 mm. long, rounded at base, acute; ribs rather sharp and prominent; interval narrow, with a single large oil-tube; styles short, with conical stylopodia; seed with a narrow rather shallow sulcus, strongly indented beneath the oil-tubes.

Collected by Mr. C. G. Pringle, in wet canyons, Sierra de San Felipe, altitude 9,000 feet, June 1, 1894 (No. 4675).

Arracacia brevipes[1] Coult. & Rose, sp. nov.

Stems 9 to 18 dm. high, branching, glabrous; leaves twice ternate, leaflets ovate, 18 to 25 mm. long, slightly lobed and serrate, acute, paler and slightly scabrous beneath; peduncles generally long (2.8 dm. or less); involucre a single leaflet or wanting; involucels of several linear bracts longer than the flowers; rays rather variable in length, 2.5 to 7.5 cm. long; pedicels, 4 mm. long; flowers yellow; fruit ovate, 5 to 6 mm. long, with long reflexed styles and conical stylopodia; ribs not prominent; oil-tubes solitary in the intervals, with 1 or 2 shorter and smaller accessory ones, 4 on the commissural face; seed with involute margins inclosing a central cavity.

Collected on the Sierra de San Felipe, altitude 10,000 feet, by Mr. C. G. Pringle, September 17, 1894 (No. 5545); and by Mr. E. W. Nelson, August 20 to 30, 1894 (No. 1097).

Arracacia (?) **filiformis** Coult. & Rose, ined.[2]

Collected by Mr. C. G. Pringle on rocky summit ridges, Sierra de San Felipe, altitude 10,500 feet, June 26 and August 4, 1894 (No. 4714); and by Mr. E. W. Nelson on the summit of Mount Zempoaltepec, altitude 11,400 feet, July 9, 1894 (No. 621), Sierra de San Felipe, altitude 9,500 to 11,000 feet, August 20 to 30, 1894 (No. 1088).

Arracacia nelsoni Coult. & Rose, sp. nov.

Stems 2.5 to 5 cm. high, from slender creeping roots, slightly branching; leaves twice ternate; leaflets ovate, 18 to 35 mm. long, serrate, acute, paler and glabrous beneath; peduncles 5 to 10 cm. long; involucre a single scarious bract, 6 mm. long; involucels of several filiform bracts about the length of the pedicels; rays 2.5 to 5 cm. long; pedicels 4 mm. long; fruit ovate, 5 mm. long, beaked, with prominent ribs; styles long, erect; stylopodia conical; oil-tubes solitary in the intervals, 4 on the commissural side; seed with a narrow sulcus extending to the middle.

Collected by Mr. E. W. Nelson from the tops of the mountains 18 miles southwest of the city of Oaxaca, between altitude 7,500 to 9,500 feet, September 10 to 20, 1894 (No. 1382). There is some confusion regarding this number, as Mr. Nelson's notes under it refer to a composite. The number may be duplicated.

Arracacia ovata Coult. & Rose, sp. nov.

Stems 12 to 18 dm. high; radical leaves twice ternate, with long petioles; leaflets pedicellate, broadly ovate, acute, rounded or cordate at base, sometimes with a

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[1] This may be the plant referred by Mr. Hemsley in Biologia Centrali-Americana to *Tauschia coulteri* Gray, Pl. Lindh. ii, 211 (1850). Coulter's species, however, came from Real del Monte, and while it is like *A. brevipes* in habit, has different foliage, longer pedicels, etc. It does not belong with *Tauschia nudicaulis* but its relations are with Arracacia, and it may be referred as **Arracacia coulteri** (Gray).—J. N. R.

[2] The technical description and illustration of this species will appear in a future number of Hooker's Icones Plantarum. It was my intention to republish it here, but owing to some delay, the number of the Icones to contain the description has not yet been issued. I have, therefore, withdrawn the description from the proof.—J. N. R.

COAXANA PURPUREA Coult. & Rose.

lateral lobe, 5 to 5.7 cm. long, 3 to 5.5 cm. broad, finely serrate; peduncles thick, 5 to 15 cm. long; rays numerous, about equal, 3.5 to 5 cm. long; pedicels 4 mm. long; involucels present; fruit oblong, 6 mm. long, rounded at base; ribs sharp and prominent; intervals broad, each with 3 small oil-tubes, 4 oil-tubes on the commissural side; styles not long, with conical stylopodia; seed with moderately broad sulcus, extending to middle.

Collected by Mr. E. W. Nelson on rocks near the top of the Sierra Madre near Chilpancingo, Guerrero, altitude 9,500 feet, December 24, 1894 (No. 2223).

Arracacia pringlei Coult. & Rose, sp. nov.

Perennial; stems 3 to 6 dm. high, branching above, glabrous; radical leaves 3 to 4 times ternate, ovate, acute, coarsely lobed or serrate, 18 to 25 mm. long; peduncles 3 to 12.5 cm. long; rays numerous, 12 to 18 mm. long; involucre of 1 or 2 linear scarious-margined bracts as long as or longer than the rays; involucels of 1 to 3 conspicuous bracts, 12 mm. long, extending much beyond the flowers; pedicels short, 2 mm. long; flowers white (?); fruit narrowly oblong, 8 mm. long, rounded at base, slightly beaked; ribs sharp and prominent; intervals broad, normally with a single large oil-tube; styles long, with slender conical stylopodia; seed with a narrow deep sulcus and slightly indented beneath the oil tubes.

Collected by Mr. C. G. Pringle on summit ledges, Sierra de San Felipe, altitude 10,300 feet, August 29, 1894 (No. 4844).

Mr. Pringle writes: "*Arracacia pringlei* is another rare plant, evidently because it grows on shelves of nearly treeless summit knobs at over 10,000 feet altitude."

Arracacia (?) **vaginata** Coult. & Rose, sp. nov.

Stems 5 to 7.5 cm. high; radical leaves twice pinnate; leaflets ovate, coarsely serrate or cleft, obtuse, wedge-shaped at the base; peduncles 5 to 17.5 cm. long; involucre of several linear bracts or wanting; involucels of several bractlets, as long as the flowers; rays short, 6 to 28 mm. long; pedicels 2 to 4 mm. long; fruit ovate, 5 to 6 mm. long; styles long; stylopodia wanting; oil-tubes solitary in the intervals, 2 on the commissural side; seed strongly involute with closed sinus and inclosing a central cavity.

Collected by Mr. C. G. Pringle in borders of woodlands, Sierra de Clavellinas, altitude 9,000 feet, October, 1894 (No. 6008).

Berula erecta (Huds.) Coville, Contr. Nat. Herb. iv, 115 (1893); *Sium erectum* Huds. Fl. Angl. 103 (1762); *Berula angustifolia* Mart. & Koch.

Collected by Mr. E. W. Nelson in the mountains bordering on the valley of Oaxaca, altitude 6,800 to 7,800 feet, October 3, 1894 (No. 1567); also by Mr. C. G. Pringle in springy places in the Sierra de San Felipe, altitude 7,500 feet, September 10, 1894 (No. 5544).

Coaxana, Coult & Rose, gen. nov. (Selineæ).

Calyx teeth obsolete. Fruit oblong, glabrous and glaucous, with low conical stylopodium bearing a rather long recurved style. Carpel 3- or 4-winged (the lateral wings always present, with either 2 intermediates or a single dorsal). Oil-tubes 6 to 8, with 2 on the commissural side. Seed (immature) sulcate beneath the oil-tubes with a flattish or concave face.—Caulescent perennials, with ternately compound leaves (having very prominent inflated sheaths), no involucre (or sometimes a single bract), and conspicuous involucels of narrow toothed bractlets.

Apparently most nearly allied to Thaspium, but different from it in its foliage, conspicuous involucels, conical stylopodia, and numerous oil-tubes.

Coaxana purpurea Coult. & Rose, sp. nov. PLATE V.

Herbs 9 to 18 dm. high, glabrous and glaucous, more or less purplish throughout; radical leaves 3 dm. long, thrice ternate; leaflets reticulate and much paler beneath, sharply and doubly serrate; stem leaves much smaller, with very much inflated sheaths; peduncles short, 5 to 7.5 cm. long; involucral leaf when present 3.6 cm.

long; involucels conspicuous, much longer than the flowers, 1.8 to 2.5 cm. long; rays 15 to 20, nearly equal, 3.6 cm. long; pedicels 5 cm. long.

Collected by Mr. E. W. Nelson on the southwest side of the summit of Mount Zempoaltepec, altitude 10,000 to 11,000 feet, July 5 to 13, 1894 (No. 646).

EXPLANATION OF PLATE.—Fig. *a*, dorsal view of carpel, enlarged 5 diameters; *b*, cross section of the fruit, enlarged 8 diameters.

Daucus montanus Humb. & Bonp.; Schult. Syst. vi, 482 (1820).

Collected by Mr. E. W. Nelson on the west slope of Mount Zempoaltepec, altitude 7,700 to 8,000 feet, July 5 to 13, 1894 (No. 571); and by Mr. C. G. Pringle on Sierra de San Felipe, altitude 7,500 feet, September 11, 1894 (No. 4884); also by Mr. E. W. Nelson near the road between Juquila and Nopala, altitude 6,000 feet, March 4, 1895 (No. 2407).

Deanea Coult. & Rose, Bot. Gaz. xx, 372 (1895).

Calyx teeth obsolete. Fruit oval, glabrous, with 2-parted carpophore and broad conical stylopodia bearing short styles. Carpel with dorsal and intermediate ribs thickened-filiform; lateral wings broad and thin, surrounding the fruit. Oil-tubes 1 to 3 in the intervals, 6 to 8 on the commissural side. Seed strongly flattened, the face with a narrow sulcus which connects with a narrow cavity extending laterally across the face of the section, making a strongly involute seed.—Short-caulescent perennials, with filiform or tuberous roots, ternately or pinnately dissected leaves, involucre wanting or of a single bract, involucels of small linear bractlets, and purple flowers.

There is a general resemblance in habit to Rhodosciadium Wats., but the obsolete calyx teeth, more prominent stylopodium, and especially the peculiar cavity of the seed face, plainly separate it. Prionosciadium Wats. has a somewhat similar seed-face, but its species are high-caulescent even shrubby plants, with much larger and more prominently ribbed fruit, depressed stylopodium, and short calyx teeth.

The genus is dedicated to Mr. Walter Deane, of Cambridge, Mass., whose interest in American botany and botanists deserves commemoration.

Deanea nudicaulis Coult. & Rose, Bot. Gaz. xx, 372 (1895). PLATE VI[1].

Shortly caulescent, or acaulescent, 3 to 5 dm. high, from thick branching roots; radical leaves dark-green, 2 to 3 times ternate; leaflets ovate, lobed and toothed, acute, glabrous; stem leaves reduced to inflated sheaths, with 1 to 3 small leaflets, often opposite; fruiting rays (3 to 8), spreading, 2.5 to 5 cm. long, slightly scabrous on the angles; pedicels 3 to 6 mm. long; fruit 5 mm. in diameter; wings thin, as broad or half as broad as body; oil-tubes 2 to 4 in the intervals, 6 on the commissural side.

Collected by Mr. C. G. Pringle on the Sierra de San Felipe, altitude 7,500 to 10,000 feet, May 28, 1894, and August 3, 1894 (No. 4663); and by Mr. E. W. Nelson on the Sierra de San Felipe, at an altitude of 10,000 to 11,000 feet, September 20 to 30, 1894 (No. 1087).

EXPLANATION OF PLATE.—Fig. 1, flowering plant; 2, fruiting umbel; 3, dorsal view of carpel; 4, cross section of same; 3 and 4 enlarged.

Deanea tuberosa Coult. & Rose, Bot. Gaz. xx, 373 (1895).

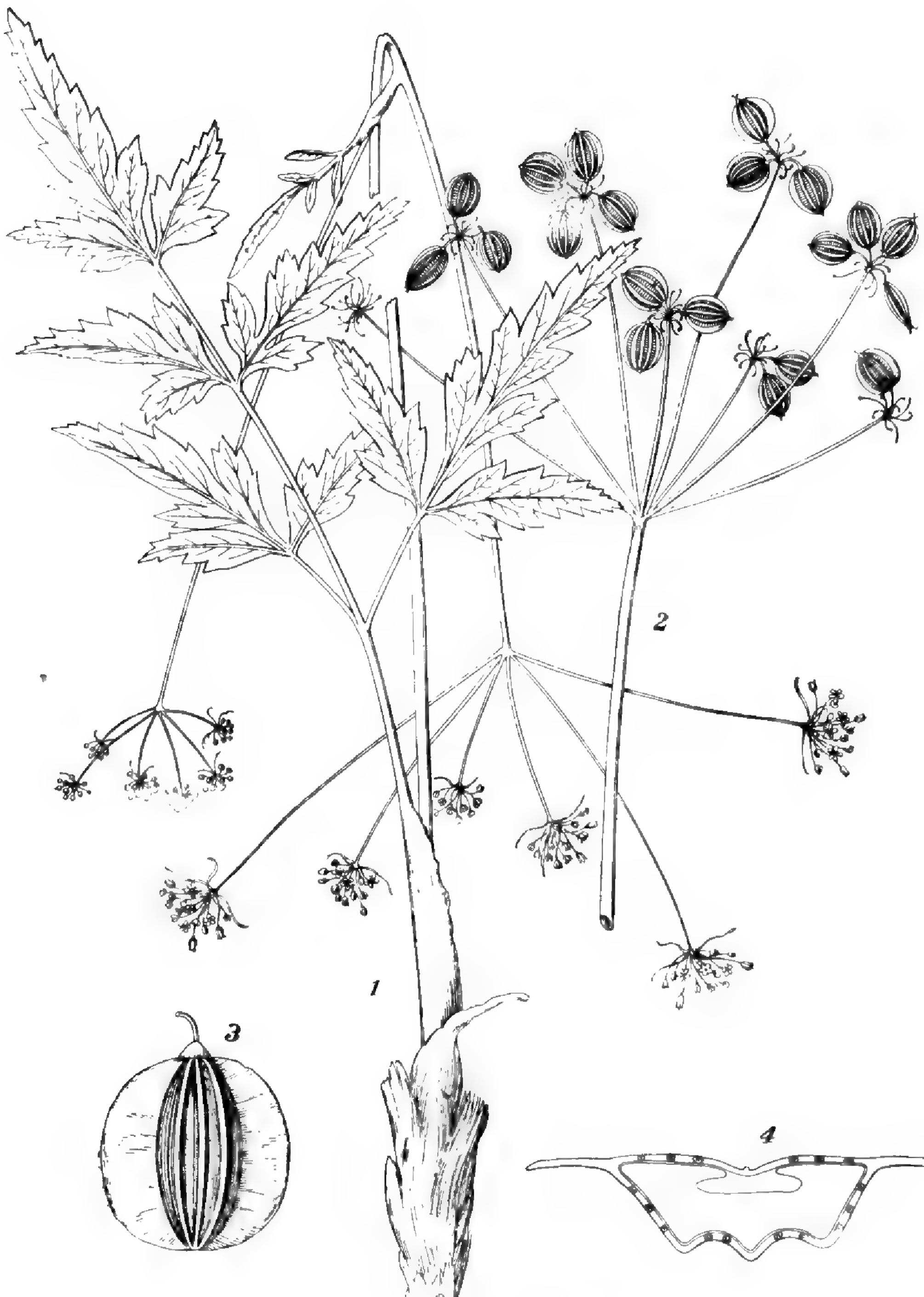
Shortly caulescent, 5 to 7.2 dm. high, from a globose tuber; leaves twice pinnate; leaflets sharply toothed or cleft into linear segments, slightly scabrous beneath; peduncle 2 to 3 dm. long; rays 5 to 8, unequal, 1.2 to 5 cm. long; pedicels 2 mm. long; fruit about 6 mm. in diameter; wings thin, about as broad as body; oil-tubes 1 to 3 in the intervals, 6 to 10 on the commissural side.

Collected by Mr. C. G. Pringle in low meadows, valley of Toluca, State of Mexico, October 3, 1892 (No. 4295). Distributed by Mr. Pringle as a Rhodosciadium.

Eryngium alternatum Coult. & Rose, sp. nov.

Stem 9 to 18 dm. high; radical and lower stem leaves linear, 4.5 dm. long, 12 mm. broad; marginal spines in pairs, one very long and one short, or long and short sepa-

[1] From the Botanical Gazette by the kind permission of the editors.



DEANEA NUDICAULIS Coult. & Rose.

rate, alternating, the longer spines 25 mm. long; upper stem leaves 3-lobed or 3-cleft; uppermost leaves linear, entire; heads numerous, small, on short peduncles; involucral bracts linear, entire, longer than the heads; involucels conspicuous.

Collected by Mr. E. W. Nelson from near the top of Sierra Madre near Chilpancingo, Guerrero, altitude 9,000 to 10,200 feet, December 24, 1894 (No. 2248).

Eryngium beecheyanum Hook. & Arn. Bot. Beech. 294 (1839 or -40).

Collected by Mr. C. G. Pringle on the continental divide near Las Sedas, altitude 6,000 feet, August 16, 1894 (No. 5544a); also by Mr. E. W. Nelson on mountains at north end of Valley of Oaxaca, altitude 6,800 to 7,800 feet, October 3, 1894 (No. 1565).

We have not seen either type or authentic specimens of this species, but this reference seems reasonably certain.

Eryngium bromeliæfolium Delar. Eryng. Hist. 60, t. 28 (1808).

Collected by Mr. E. W. Nelson near Reyes, October 20, 1894 (No. 1739); summit of Mount Zempoaltepec, altitude 11,400 feet, July 9, 1894 (No. 620); Sierra de San Felipe, September 20 to 30, 1894 (Nos. 1182, 1129); also by Mr. C. G. Pringle, mountains about Oaxaca, altitude 10,000 feet, May 22, 1894 (No. 5540); Sierra de San Felipe, altitude 10,000 feet, November 14, 1894 (No. 6045); Sierra de Reyes, altitude 10,000 feet, November 9, 1894 (No. 6038).

More than one species may be represented among these specimens.

Eryngium carlinæ Delar. Eryng. Hist. 53, t. 23 (1808).

Collected by Mr. C. G. Pringle in fields near Orizaba, State of Vera Cruz, February 2, 1895 (No. 5553).

Eryngium cymosum Delar. Eryng. Hist. 63, t. 31 (1808).

Collected by Mr. E. W. Nelson along the road between Tixtla and Chilpancingo, Guerrero, December 16, 1895 (No. 2172).

Eryngium deppeanum Cham. & Schlecht. Linnæa, v, 207 (1830).

Collected by Mr. E. W. Nelson in the Valley of Oaxaca, altitude 5,500 to 7,500 feet, September 20, 1894 (No. 1443); near the road between Ayusinapa and Petatlan, Guerrero, altitude 5,000 to 7,000 feet, December 14, 1894 (No. 2119); also by Mr. C. G. Pringle, Sierra de San Felipe, altitude 7,500 feet, October 5, 1894 (No. 5548a).

Eryngium ghiesbreghtii Decaisne, Bull. Soc. Bot. France, xx, 21 (1873).

Stems from a cluster of slender fleshy-thickened roots, 6 to 12 dm. high, either simple or more or less branched; radical and lower stem leaves lanceolate, acute, rounded or somewhat cordate at base, serrate, 7.5 to 10 cm. long, on petioles 7.5 to 12.5 cm. long; upper stem leaves much reduced, opposite; peduncles slender; heads oval or short-oblong, 12 to 15 mm. long; involucral bract shorter than the heads, lanceolate, pungent, with 2 to 4 spiny teeth or lobes; bractlets of the involucels linear, entire, pungent.

Collected by Mr. C. G. Pringle in oak woods on the Sierra de San Felipe, altitude 7,500 feet, November 17, 1894 (No. 4746); and by Mr. E. W. Nelson on mountains near Tlapancingo, altitude 6,000 to 8,000 feet, December 7, 1894 (No. 2061).

Eryngium involucratum Coult. & Rose, sp. nov.

Stems low, 6 dm. high; radical and lower stem leaves linear, 15 to 20 cm. long; the margins with spiny teeth, the longer ones longer than the breadth of the leaves; upper stem leaves opposite, deeply cleft; involucral leaves numerous, conspicuous, much longer than the large heads, lanceolate, with pungent teeth; bractlets of the involucels linear, pungent.

Collected by Mr. C. G. Pringle on Sierra de San Felipe, altitude 10,000 feet, November 14 and December 24, 1894 (No. 4747).

Eryngium longirameum Turcz. Bull. Soc. Nat. Mosc. xx, pt. 1, 171 (1847).

Collected by Mr. C. G. Pringle on the Cuesta de San Juan del Estado, altitude 7,500 feet, August 21, 1894 (No. 4910); also by Mr. E. W. Nelson 18 miles southwest

of the city of Oaxaca, altitude 7,500 feet, September 10 to 20, 1894 (No. 1366); La Parada, altitude 7,500 to 8,500 feet, August 19, 1894 (No. 1007); west slope of Mount Zempoaltepec, altitude 7,700 to 8,000 feet, July 5 to 13, 1894 (No. 607); mountains near Tlapancingo, altitude 6,000 to 8,000 feet, December 7, 1894 (No. 2083); on the top of Sierra Madre, near Chilpancingo, Guerrero, altitude 9,000 to 10,200 feet, December 24, 1894 (No. 2213); also by Rev. Lucius C. Smith, mountains of San Juan del Estado, altitude 7,500 feet, August 13, 1894 (No. 119).

We have seen no authentic specimens of *E. longirameum*. Our specimens differ from the description in having leaves cordate-ovate rather than "ovato-ellipticis."

Eryngium montanum Coult. & Rose, sp. nov.

Stems 6 to 7.5 cm. long; leaves numerous at base, linear, 2 to 3.2 dm. long, 12 to 15 mm. broad; the margins with numerous spiny teeth, single and much shorter than the breadth of the leaves; stem leaves much reduced and mostly alternate; stems often monocephalous or sometimes bearing 3 or 4 heads; heads oblong, obtuse, 25 to 30 mm. long; involucral bracts numerous, linear, entire or with a few teeth at base, shorter than the heads; bractlets of the involucels linear, rigid.

Collected in wet meadows, Sierra de Clavellinas, altitude 9,000 feet, by Mr. E. W. Nelson, September 10 to 20, 1894 (No. 1386); and also by Mr. C. G. Pringle, October 17, 1894 (No. 6040).

Eryngium nasturtiifolium Juss.; Delar. Eryng. 46, t. 17 (1808).

Collected by Mr. E. W. Nelson from the low damp plains about Tlacotalpan, Vera Cruz, May 21, 1894 (No. 518).

Eryngium nelsoni Coult. & Rose, sp. nov.

Stems from a cluster of slender fibrous roots, 15 to 20 cm. high, somewhat branching; leaves spatulate, obtuse, tapering at base into a winged petiole, with callous margins, crenate and apiculate, 3.5 to 7.5 cm. long including the petiole; upper leaves reduced, opposite and more or less lobed; peduncles either single or in threes, slender, 6 to 15 cm. long; involucral bracts about 10, little if at all longer than the oval heads, linear-oblong, apiculate, entire or often with a small tooth on the side, greenish or bluish without, white and shining within; involucel bractlets linear, rigid, about the length of the flowers; fruit obovate, with small scales, especially above.

Collected by Mr. E. W. Nelson near La Parada, altitude 7,500 to 8,500 feet, August 19, 1894 (No. 1011), and on mountains about Yalalag, altitude 6,000 feet, August 1, 1894 (No. 972).

Near *E. scaposum*, but apparently distinct.

Eryngium scaposum Turcz. Bull. Soc. Nat. Mosc. xx, pt. 1, 172 (1847).

Collected by Mr. E. W. Nelson near Reyes, altitude 7,500 to 10,400 feet, October 20, 1894 (No. 1747), and in the vicinity of Sierra de San Felipe, altitude 9,500 to 11,000 feet, 1894 (No. 1091); also by Mr. C. G. Pringle on Sierra de San Felipe, altitude 10,400 feet, June 26 and August 25, 1894 (Nos. 4834 and 5538).

We have no authentic specimens of *E. scaposum*, in fact the species has not been collected since the original collection made by Galeotti from this same State. The leaves are oblong, with tapering bases, hardly "oblongo-lanceolatis." The scapes, while usually bearing single heads, often in vigorous plants produce additional heads from the axils of the leafy bracts.

This species appears to be near *E. gracile*.

Eryngium seatoni Coult. & Rose, Proc. Amer. Acad. xxviii, 118 (1893).

Stem erect, stout, 9 to 12 dm. high; leaves linear, parallel-nerved; radical leaves 3 to 3.75 cm. long, 8 to 10 mm. wide, the margin toothed with paired spines, one much longer and about equal to the breadth of leaf; stem leaves all alternate, with marginal spines often in threes and fours, clasping at base; heads few, terminal and axillary, shortly pedunculate, oblong, 20 mm. long; involucre of 14 or 15 bracts,

oblong-linear, sharp-pungent, 5 cm. or more long, with 3 or 4 pairs of spines or the inner ones sometimes entire; bractlets blue, pungent, a little longer than the flowers.

Collected by Mr. E. W. Nelson on Mount Orizaba, altitude 10,500 to 13,800 feet, March 18, 1894 (No. 271).

The type was collected by Mr. Henry Seaton from this mountain in 1891.

Near *E. protæflorum*, but with more scattered stem leaves, narrower radical leaves, and fewer bracts, and bearing several heads. Galeotti's No. 2763, which was found on Mount Orizaba at exactly the altitude of the type and referred to *E. protæflorum*, is in all probability the above plant.

Fœniculum fœniculum (L.) Karst. Deutsch. Fl. 837 (1880–83); *Anethum fœniculum* L. Sp. Pl. i, 263 (1753).

Collected by Mr. E. W. Nelson on the side of the trail between Coixtlahuaca and Tamazulapan, Oaxaca, November 12, 1894 (No. 1934).

Reported as very rare. This species we have not seen before from Mexico, although it has doubtless become established in some places.

Hydrocotyle bonariensis Lam. Encycl. iii, 153 (1789).

Collected in the vicinity of Cuicatlan, altitude 2,000 feet, by C. G. Pringle, November 6, 1894 (No. 5551); and by Mr. E. W. Nelson, October 8 to 24, 1894 (No. 1624); also by Rev. Lucius C. Smith, August 20, 1894 (No. 120).

Hydrocotyle mexicana Cham. & Schlecht. Linnæa, v, 208 (1830).

Collected by Mr. C. G. Pringle in damp woods, Sierra de Reyes, altitude 8,000 feet, November 8, 1894 (No. 6036); and by Mr. E. W. Nelson in the vicinity of Totontepec, altitude 5,500 to 7,000 feet, July 15 to 20, 1894 (No. 769); vicinity of Cuicatlan, altitude 1,800 to 2,500 feet; October 8 to 24, 1894 (No. 1751); mountains near Tlapancingo, December 7, 1894 (No. 2084); vicinity of Choapam, altitude 3,800 feet, July 28 to 29, 1894 (No. 864); also by Mr. Pringle along shaded banks, Orizaba, Vera Cruz, February 4, 1895 (No. 5555); and by Mr. Nelson near Plunia, altitude 3,000 to 4,800 feet, March 17, 1895 (No. 2470).

Hydrocotyle prolifera Kellogg, Proc. Cal. Acad. i, 14 (1854).

Collected by Mr. E. W. Nelson at Orizaba, January 28, 1894 (No. 41); also by Mr. C. G. Pringle on moist sands near Vera Cruz, April 23, 1894 (No. 5554).

Micropleura renifolia Lag. Ocios Esp. Emigr. iv, 347 (1825); Obs. Aparas. 15 (1826).

Collected by Mr. C. G. Pringle on the Sierra de San Felipe, September 10, 1894 (No. 4664); also by Mr. E. W. Nelson on the west slope of Mount Zempoaltepec, altitude 7,700 to 8,000 feet, July 5 to 13, 1894 (No. 588); vicinity of Totontepec, altitude 5,500 to 7,000 feet, July 15 to 20, 1894 (No. 746); and near La Parada, altitude 7,500 to 8,500 feet, August 19, 1894 (No. 1019).

Museniopsis Coult. & Rose, Revision Umbelliferæ, 123 (1889), enlarged.

Calyx teeth obsolete. Stylopodium wanting or low and depressed: fruit flattened laterally, oblong to ovate, often cordate at base, rounded or slightly beaked, glabrous: carpels terete or slightly flattened laterally, with equal filiform ribs and thin pericarp: oil-tubes indefinite: seed face strongly involute, often inclosing a central cavity.—Low and acaulescent or taller, caulescent, and much branched. Leaves mostly much dissected, either toothed or with long filiform segments. Umbels mostly numerous and small; involucre and involucels generally wanting; flowers always yellow.

This genus differs from Eulophus proper in the absence of calyx teeth, in the small or wanting stylopodia, in the flattening of the carpel, in the seed face, the color of the flowers, etc. From Arracacia it differs especially in its habit, smaller fruit, more indefinite oil-tubes, etc. We have experienced more difficulty in separating it technically from Velæa than from either of the above genera, although we consider it as equally distinct. Typical Velæa is stouter, with broader leaves, strongly toothed

leaflets, and much larger fruit, is always scapose, occasionally has calyx teeth, and its umbels are stouter, with much more numerous rays.

Ever since our study of Eulophus and the related genera in 1886–'87 we have felt dissatisfied with Bentham and Hooker's treatment of this group in the Genera Plantarum. In the Revision of Umbelliferæ we attempted to express our idea of the relationship of the forms found in the United States. This led to the cutting off as a new genus (Museniopsis) *E. texana* Benth. & Hook., which had been originally placed by Dr. Gray in a separate section of Tauschia, and the combining with *Eulophus americana* the two western species of Podosciadium (*P. californica* and *P. bolanderi*) along with two undescribed species (*E. pringlei* and *E. parishii*). This made what we then thought and still think a very natural genus of 5 species. As we then stated, this genus is remarkably well defined, being readily recognized by such external characters as its elongated linear entire leaflets, fascicled tubers, conspicuous involucels, prominent calyx teeth, conical stylopodium, and long recurved styles. Its nearest alliance is to Pimpinella, from which it differs, not only in most of the characters just noted, but also in the concavity of the seed face. The broad concavity of the seed face, as well as its comparative shallowness, is one of the marked characters of this genus, and not only separates it from certain allied genera, but also excludes from it the Mexican species which have been referred to it. These are *E. ternatus* and *E. tenuifolius*, at the time referred to above just described by Dr. Sereno Watson, and *E. peucedanoides* Benth. & Hook.

This last species has also been referred to Smyrnium, Silaus, and Cnidium. Since our Revision was published in 1888, material has come to hand which shows 7 additional Mexican species. A careful study of a very large supply of material has led us to combine the Mexican species of Eulophus with our single border species under the name of Museniopsis. It is true that *M. texana* is hardly a typical representative of the genus, but is more like an outlying form of a genus whose center of distribution is somewhere in Central Mexico. The species grade easily through *M. ternata* into the taller caulescent Mexican species. Museniopsis is much nearer Arracacia and Velæa than Eulophus. Dr. Watson[1] thought it could be "separated only by its smaller obsoletely ribbed fruit with numerous irregular vittæ." The confusion of Museniopsis with Eulophus is probably due partly at least to the figure of the fruit section of Eulophus as originally published in De Candolle.[2] The seed is there shown as strongly involute, while Dr. Torrey's sketches and our examination of many carpels show a seed with a broad face and but slightly concaved.

The following key will be found useful in determining the species:

A. *Acaulescent or nearly so; peduncles single, terminal, and elongated; involucels toothed.*

B. *Leaflets ovate, toothed; peduncles 1 to 1.2 dm. long; fruit obtuse.*

1. **Museniopsis texana** (Gray) Coult. & Rose, Rev. Umb. 123 (1889); *Tauschia texana* Gray, Pl. Lindh. ii, 211 (1850); *Eulophus texanus* Benth. & Hook. Gen. Pl. i, 882, 885 (1867).

BB. *Leaflets filiform; peduncles 3 dm. long; fruit acutish.*

2. **Museniopsis tenuifolia** (Watson); *Eulophus tenuifolius* Watson, Proc. Amer. Acad. xxiii, 276 (1888).

AA. *More or less caulescent, much branched; peduncles numerous, both terminal and lateral, short; involucels either wanting or filiform and entire.*

C. *Biennials from small globose or spindle-shaped tubers.*

D. *Radical leaves with ovate, toothed leaflets; involucre and involucels present.*

3. **Museniopsis ægopodioides** (H. B. K.); ? *Smyrnium ægopodioides* H. B. K. Nov. Gen. et Sp. v, 16 (1821).

Biennials from fusiform tubers; stems slender, 4 to 12 dm. high, branching above; radical leaves with petioles 3 to 5 cm. long, twice ternate, with ovate toothed leaf-

[1] Proc. Amer. Acad. xxii, 415.

[2] Memoire Ombelliferes, pl. 2, H, 3.

lets; upper leaves much reduced, often with linear leaflets; peduncles either wanting or short; pedicels 4 to 5 mm. long.

Collected by Mr. C. G. Pringle in pine woods on hills of Pascuaro, State of Michoacan, October 25, 1893 (No. 4620). It was distributed by Mr. Pringle in his 1893 set as *Smyrnium ægopodioides*.

Mr. Hemsley in a recent letter states that Seeman No. 2134 belongs here. As he says, it is very doubtful whether this is the true *Smyrnium ægopodioides*.

DD. *Radical leaves with linear leaflets; involucre and involucels wanting.*

4. **Museniopsis tuberosa** Coult. & Rose, sp. nov.

Biennials from a small round or spindle-shaped tuber; stems very slender, somewhat zigzag, 3 to 6 dm. high, much branched above; leaves much dissected into linear entire segments, 4 to 10 mm. long; peduncles short, 1.2 to 3.6 cm. long; rays (2 to 6) 12 to 25 mm. long; pedicels 1 to 3 mm. long; fruit oval, 2 mm. long, obtuse.

Collected by Mr. C. G. Pringle on Sierra de San Felipe, altitude 7,500 feet, August 7 and November 17, 1894 (No. 4868); and by Mr. E. W. Nelson in oak woods on the mountain ridge on west side of the Valley of Cuicatlan, altitude 7.500 to 8,000 feet, November 10, 1894 (No. 1900a); from the top of the Sierra Madre near Chilpancingo, State of Guerrero, altitude 9,000 to 10,200 feet, December 24, 1895 (No. 2241).

CC. *Perennials from long slender and sometimes thickened roots.*

E. *Radical leaves with linear elongated leaflets.*

F. *Glaucous; fruit obtuse, with obsolete ribs; lateral umbels often sessile.*

G. *Involucral leaf 1, elongated; fruit smaller and leaflets shorter than in the next.*

5. **Museniopsis ternata** (Watson); *Eulophus ternatus* Watson, Proc. Amer. Acad. xxiii, 276 (1888).

Museniopsis ternata filifolia Coult. & Rose, var. nov.

Much like the type but more slender, with filiform leaflets, longer pedicels, etc.

Collected by Mr. C. G. Pringle in canyons, Sierra Madre, Chihuahua, October 1, 1887 (No. 1519).

This may prove a distinct species. Dr. Watson thought it a possible variety of *E. peucedanoides*, but to us its relationships seem nearer the above. Dr. Watson's herbarium name is continued.

GG. *Leaflets very long; involucre wanting; fruit large for the genus.*

6. **Museniopsis schaffneri** Coult. & Rose, sp. nov.

Roots slender and elongated; stem tall, slender, glabrous, and glaucous; radical leaves twice ternate; leaflets linear, elongated, 10 cm. long or less, with strong medial and intermarginal nerves; rays spreading, slender, 4 to 7.5 cm. long; pedicels slender, 6 to 10 mm. long; involucre and involucels wanting; fruit (immature) broadly ovate, 4 mm. long, cordate at base, capped with low stylopodia.

Collected by Dr. J. G. Schaffner in "rupestris prope San Miguelito," San Luis Potosi, 1876 (No. 5), and in 1879 (No. 550); also by Parry & Palmer from the same State, 1878 (No. 293).

This species has been confused with *Eulophus peucedanoides*, from which it is distinct, differing chiefly in its longer rays and pedicels, the shape and size of fruit, distinct stylopodia, and perhaps in leaflets and habit.

FF. *Glabrous, not glaucous; involucre wanting; no umbels sessile.*

H. *Fruit ovate or oblong, longer than broad, with a short beak and rounded base; ribs thick, filiform.*

7. **Museniopsis peucedanoides** (H. B. K.); *Cnidium peucedanoides* H. B. K. Nov. Gen. et Sp. v, 15 (1821); *Eulophus peucedanoides* Benth. & Hook. Gen. Pl. i, 885 (1867).

Collected from Sierra de San Felipe by Mr. C. G. Pringle, October 13, 1894 (No. 5543); and by Mr. E. W. Nelson, August 20 to 30, 1894 (No. 1190).

HH. *Fruit broadly ovate, broader than long, cordate at base, obtuse; ribs filiform.*

8. **Museniopsis cordata** Coult. & Rose, sp. nov.

Perennials with slender either simple or somewhat branched roots; stems slender, 5 to 7.5 dm. high, nearly simple or more or less branched; radical leaves with slender petioles, 7.5 to 12.5 cm. long, 3 to 4 times ternately parted; leaflets linear and entire, somewhat wedge-shaped and 3-lobed, 3.6 cm. or less long; upper leaves more simple; peduncles rather short, usually 5 to 10 cm. long; rays of the umbel 4 to 6, nearly equal, 2.5 to 6 cm. long; pedicels 4 to 6 mm. long; involucre and involucels wanting; fruit ovate, cordate at base, 3 mm. or less high, broader than high, with a low stylopodium; ribs filiform, indistinct.

Collected by Mr. C. G. Pringle in dry pine woods, Sierra de San Felipe, altitude 9,300 feet, August 28, 1894 (No. 5548), Sierra de Reyes, altitude 8,000 feet, November 7, 1894 (No. 5549), also by Mr. E. W. Nelson, in mountain range west side of Cuicatlan, altitude 6,500 to 8,000 feet, November 10, 1894 (No. 1900).

EE. *Radical leaves with broader, shorter, more or less toothed leaflets.*

I. *Umbels all peduncled; leaflets glabrous; involucels present.*

9. **Museniopsis dissecta** Coult. & Rose, sp. nov.

Perennials from thick roots; stems 3 to 6 dm. high, branching; leaves ternately dissected; leaflets ovate and cleft; pedicels 5 to 7.5 cm. long; rays 3 to 6, 12 to 30 mm. long; involucre wanting or of a single linear leaf; involucels of a few linear bracts; fruit oblong-ovate, 4 mm. long.

Collected by Mr. E. W. Nelson from the mountains near Tlapancingo, altitude 6,000 to 8,000 feet, December 7, 1894 (Nos. 2062, 2091a), and from the top of the Sierra Madre near Chilpancingo, State of Guerrero, December 24, 1894 (No. 2242).

II. *Lateral umbels often sessile; veins of the leaflets scabrous; involucels wanting.*

K. *Leaflets elongated, linear, nearly entire.*

10. **Museniopsis scabrella** Coult. & Rose, sp. nov.

Perennials with slender roots; stems slender, 6 to 10.5 dm. high, somewhat branched above; radical leaves with slender petioles, 10 to 17.5 cm. long, 2 to 3 times ternate; leaflets linear and entire, 5 to 7.5 cm. long, or broader and shorter, more or less toothed, all more or less scabrous on the veins, margins, and petioles; upper leaves more simple; peduncle rather short or wanting; rays 3 or 4, rather variable in length, but nearly equal in the same umbel, 2.5 to 7.5 cm. long; pedicels 4 mm. long; involucre and involucels wanting; fruit ovate, 3 mm. long; ribs filiform, indistinct.

Collected by Mr. C. G. Pringle on the Sierra de San Felipe, altitude 7,000 feet, September 10, 1894 (No. 5550), and by Mr. E. W. Nelson in oak woods on the mountain ridge on west side of the Valley of Cuicatlan, altitude 7,500 to 8,000 feet, November 10, 1894 (No. 1900).

KK. *Leaflets ovate, serrate.*

11. **Museniopsis serrata** Coult. & Rose, sp. nov.

Perennials from slender roots; radical and lower stem leaves twice ternate; leaflets ovate, acute, serrate; upper stem leaves reduced, with filiform leaflets; peduncles short; rays 5, 18 to 35 mm. long; fruit ovate, cordate at base.

Collected by Mr. C. G. Pringle from the Cuesta de San Juan del Estado, altitude 7,000 feet, August 21, and from the continental divide near Las Sedas, altitude 6,300 feet, November 7, 1894 (No. 5542); also by E. W. Nelson, near Las Sedas, October 3, 1894 (No. 1539).

Musineon alpinum Coult. & Rose, Bot. Gaz. xx, 260 (1895).

Acaulescent, in dense mats, from a thick branching caudex, 5 to 10 cm. high, glabrous throughout, or nearly so; leaves once to twice pinnate, somewhat shorter than the peduncles, the primary segments ovate and more or less lobed or pinnately parted, and usually with a pubescent ring on the rachis at the junction; peduncles thick, bearing a few-flowered 4- to 6-rayed umbel, with no involucre, the involucels of few linear bractlets longer than pedicels; rays unequal, 6 to 12 mm. long; pedicels 2 to 4 mm. long; flowers not seen; fruit glabrous, oblong-ovate, with notched

NEOGOEZIA GRACILIPES Hemsley.

base and blunt apex, 3 mm. long, with filiform ribs and long, flat (strap-shaped) styles.

Cold summit slopes, Nevada de Toluca, State of Mexico, altitude 14,000 feet, September 2, 1892. Pringle's No. 4247 of 1892.

This species is referred to Musineon, although it is widely separated geographically from the other species, which belong to the northern plain region. Its habit and general characters are those of the genus as already known, but the obsolete calyx teeth, two-parted carpophore, and peculiar styles, as well as the wide geographic separation, suggest a possible generic separation if supported by further Mexican material. The fact that it occupies the high mountain region of central Mexico makes its claim to be congeneric with the northern forms more reasonable.

Neogoezia Hemsley, Kew Bull. 1894, 354 (1894).

The translation of Mr. Hemsley's description, and his remarks concerning the establishment of the genus, are as follows: Calyx teeth prominent, colored. Petals broad, entire. Disk depressed or subconical. Fruit didymous, heart-shaped, scarcely compressed laterally, sulcate at the commissure. Carpels almost terete, gibbous at base, striate with the superficial oil tubes: primary ribs almost obsolete: oil-tubes 3 in the intervals, 4 to 6 on the commissural side, all very slender: carpophore entire. Seed subterete, deeply sulcate.—Glabrous Mexican herbs, perennial or biennial, scapose, with tuberous-fascicled roots. Leaves pinnately dissected, all radical. Umbels simple, solitary on a slender scape, with filiform pedicels. Involucral bracts numerous, linear. Flowers polygamous or unisexual; sepals purplish; petals deep yellow or lemon-yellow.

"Dedicated to Dr. Edmond Goeze, inspector of the botanic garden at Greifswald, Pomerania, and formerly a fellow-student of the writer at Kew. The affinity of the genus is not obvious, as it is one of the very few genera, outside of the Heteroscia-deæ, having simple umbels. In this character it agrees with Oreomyrrhis, in which two of the species were provisionally placed; but, as suggested by Mr. Rose, the characters of the fruit are rather those of the Smyrnieæ, and similar to those of the American genus Arracacia.

"Through the courtesy of Mr. J. N. Rose, Assistant Botanist in the United States Department of Agriculture at Washington, we are able to establish this very distinct and elegant genus of Mexican Umbelliferæ. Two species were collected by Hartweg upward of fifty years ago, but only flowering specimens were obtained. Since then, so far as our knowledge goes, no other collector has met with any member of this genus until this year; and now Mr. C. G. Pringle has discovered, in the mountains above Oaxaca, what we have described as a third species. His specimens include almost ripe fruit, thus affording material for founding the genus. Hartweg's two species were provisionally published under the genus Oreomyrrhis, and are here transferred to Neogoezia."

Neogoezia gracilipes Hemsley, Kew Bull. 1894, 355 (1894); *Oreomyrrhis gracilipes* Hemsley, Diag. Pl. Nov. pt. 1, 16 (1880). PLATE VII.[1]

Stems from a cluster of deep-seated tuberous roots, as in *N. minor*, 7.5 to 15 dm. high; petiole above the vaginate sheath very variable in length, sometimes nearly wanting, often 7.5 cm. long; leaflets generally close together along the rachis, sometimes much separated, occasionally 7.5 cm. or more; bractlets of the involucels rarely short and entire (as figured), but generally all or nearly all 3- to 5-toothed and 12 to 18 mm. long; pedicels very numerous, in fruit 3.5 to 7.5 cm. long; fruit rather variable, 4 to 6 mm. long, nearly orbicular to ovate, slightly cordate at base, sometimes beaked.

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[1] Through the kindness of the Bentham Trustees and Mr. W. Botting Hemsley of Kew, we have received advance sheets of the two plates of Neogoezia and now reproduce them almost simultaneously with their appearance in Hooker's Icones Plantarum.

Collected by Mr. C. G. Pringle on the mountain sides of Santa Inez del Monte, 8,500 feet altitude, October 5, 1894 (No. 4997); also by Mr. E. W. Nelson from the foothills on the west side of the Valley of Oaxaca, at between 5,500 and 7,500 feet altitude, in the lower Sonoran zone, September 20, 1894 (No. 1118), and on mountain sides near Tlapancingo, 6,000 to 8,000 feet altitude, in upper Sonoran zone, December 7, 1894 (No. 2088).

This species was first collected by Galeotti some fifty years ago on the Cordillera of Oaxaca, and has not been collected since until obtained by Messrs. Pringle and Nelson. Mr. Pringle, in a letter of March 19, 1895, to Mr. J. N. Rose, writes as follows: "As respects Neogoezia, No. 4997, it was found first by Mr. Nelson, then by myself more widely scattered, on a range of mountains 25 miles west of Oaxaca, which range has an altitude of 9,000 feet and may be regarded as the margin of the mountainous tract called the Mixteca Alta, over which runs in a zigzag course the continental divide. The plant is abundant on somewhat dry ridges and slopes of these mountains, at an elevation of about 8,000 feet, among a sparse growth of oaks and pines. Frankly it is my opinion that there is but one species there, though a variable one, as the conditions, fertility and humidity of soil and exposure to open sunlight, vary. The specimens were all gathered on a tract 2 or 3 miles in extent; the fruits which lie in the sheets with flowers (they are scarcely mature enough) were gathered at the same time with the flowers."

EXPLANATION OF PLATE.—Fig. 1, flower; 2, fruit; 3, cross section of carpel; 4, pedicel and flower. Figs. 1, 2, and 3, enlarged; 4, natural size.

Neogoezia minor Hemsley, Kew Bull. 1894, 355 (1894). PLATE VIII.

Collected by Mr. C. G. Pringle on mountain sides about Oaxaca, Sierra de San Felipe, at an altitude of 9,000 to 10,000 feet, in flower June 29, and at an altitude of 10,500 feet, in fruit August 25, 1894 (No. 4725); also by Mr. E. W. Nelson on Sierra de San Felipe, August 20 to 30, 1894 (No. 1418a).

Mr. C. G. Pringle sends this interesting note regarding the species: "It presents a rosette of leaves which lie close upon the surface of the soil (black humus) in little meadows and flats along the creeks of the Sierra de San Felipe, 10,000 feet elevation. This mountain chain is the continental divide, at whose base on the Pacific side, some 10 miles distant from and 5,000 feet below its summit, is located the city of Oaxaca. The flowering peduncles of this plant at anthesis rise 1 to 4 or 5 inches above the leaves, but in fruit some of them recline on the ground, while others rise quite erect."

EXPLANATION OF PLATE.—Fig. 1, flower; 2, ovary; 3, fruit; 4, cross section of carpel. Figs. 1, 2, and 3, enlarged.

Neonelsonia Coult. & Rose, gen. nov. (Smyrnieæ.)

Calyx teeth minute. Petals broader than long, with short inflexed tip. Fruit broadly ovate-cordate, didymous and beaked, glabrous, with 2-parted carpophore and low conical stylopodia bearing short recurved styles. Carpel globose-ovate, beaked and incurved, the entire surface divided among five more or less wrinkled ridges which bear filiform ribs on the back. Oil-tubes large and solitary in the intervals of the ridges, with a small accessory one on each side on the slope of the adjoining ridge, 2 to 4 on the very narrow commissural side. Seed section nearly circular in outline, strongly indented beneath the large oil-tubes, with a deep and narrow sulcus which enlarges more or less into a central cavity.—Low caulescent perennials, with ternately compound leaves, no involucre, involucels of elongated filiform bractlets, and greenish-yellow flowers.

This is nearest Smyrnium and Arracacia, but its peculiarities are so marked that it does not seem to be closely allied to any genus.

Named for Mr. E. W. Nelson, the ornithologist, who has also been an indefatigable collector of Mexican plants.

NEOGOEZIA MINOR Hemsley.

NEONELSONIA OVATA Coult. & Rose.

OSMORRHIZA MEXICANA Griseb.

Neonelsonia ovata Coult. & Rose, sp. nov. PLATE IX.

Stems 3 to 9 dm. high, glabrous throughout; root leaves large, 3 dm. or more long, 3-ternate; leaflets often 3-lobed, ovate, acute or acuminate, rounded at base or the terminal one with cuneate base, crenate with apiculate teeth, 3.5 to 7.5 cm. long; stem leaves more simple; umbels long-peduncled or sessile; rays 3.5 to 10 cm. long; pedicels 12 to 18 mm. long; bractlets of the involucels 18 to 50 mm. long; fruit 4 mm. high, 7 mm. broad.

Collected by Mr. E. W. Nelson 18 miles southwest of the city of Oaxaca, altitude 7,500 to 9,500 feet, September 10 to 20, 1894 (No. 1385); also by Mr. C. G. Pringle in deep moist woods of the Sierra de Clavellinas, 9,000 feet altitude, October 18, 1894 (No. 6007).

EXPLANATION OF PLATE.—Fig. *a*, side view of the fruit, enlarged 4 diameters; *b*, cross section of carpel, enlarged 6 diameters.

Œnanthe pringlei Coult. & Rose, sp. nov.

Stems often creeping and rooting at the joints, glabrous, with upright stems 6 to 9 dm. high; leaves twice pinnate, somewhat triangular in outline; leaflets ovate, acute, sharply serrate with cuspidate teeth, often with 1 or 2 lateral lobes, 12 to 25 mm. long; peduncles lateral and terminal, 5 to 7.5 cm. long; rays of umbel 15 to 20, nearly equal, 2.5 cm. long or less; pedicels 3 mm. long; involucre wanting; involucels of several linear bracts oblong, 4 mm. long, with thick corky ribs.

Collected by Mr. C. G. Pringle in cold bogs of the Sierra de Clavellinas, altitude 9,000 feet, October 25, 1894 (No. 6009). Most resembling our United States species, but the leaves have a more dissected appearance, the leaflets are more numerous, acute, and sharply cuspidate-serrate, the rays shorter, the fruit not in such dense umbels, more corky, making it much larger in cross section.

This is the first species of Œnanthe described from Mexico, although Mr. Hemsley reports (in the Biologia Centrali-Americana) an unnamed species[1] from near Zacoalco.

Osmorrhiza mexicana Grisebach, Goett. Abh. xxiv, 147 (1879). PLATE X.

Stems rather slender, 6 to 9 dm. high, somewhat hairy; leaves more finely dissected than in *O. nuda;* umbels with few spreading rays; involucre and involucels of linear bracts; style and stylopodium minute, very unlike those of *O. brevistylis.* Rather common in the mountains of Mexico. Generally referred to *O. brevistylis* by writers on Mexican plants, but more resembling *O. nuda.*

Collected by Mr. C. G. Pringle on the Sierra de San Felipe, altitude 10,000 feet, September 19 and in November, 1894 (No. 5547); also by Mr. E. W. Nelson in the Sierra de Clavellinas, September 10 to 20, 1894 (No. 1383). The following specimens are also in the National Herbarium: Mr. Henry E. Seaton's, from Mount Orizaba, August 6, 1891 (No. 195); Mr. C. G. Pringle's, from the State of Mexico, September 11, 1892 (No. 5208); and M. Bourgeau's, from the forest of the Desierto Viejo, 1865–66 (No. 781).

A western Cordilleran type seems to extend through North and South America, which is *O. nuda* in the United States, *O. mexicana* in Mexico, and *O. berterii* in South America.

We had described and figured this species as new, under the above name, but learned before publishing that Grisebach had anticipated us in both description and name, and had published the species in his flora of the Argentine Republic, as cited above. He includes in it the already described species from South America, which, however, seems to be distinct; but as he evidently takes Schaffner's Mexican plant as his type, his name should be retained as applying to the Mexican species.

EXPLANATION OF PLATE.—Fig. *a*, fruit, enlarged 3 diameters; *b*, cross section of carpel, enlarged 9 diameters.

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[1] Mr. Hemsley now considers his plant to be *Arracacia multifida* Watson.

Ottoa œnanthoides H. B. K. Nov. Gen. et Sp. v, 20 t. 423 (1821).

Stems rather variable in height, 2 to 4.5 dm. high; leaves fistulose, nodose; rays variable in length; flowers white; fruit on pedicels 5 to 8 mm. long, or the central one sessile or nearly so, ovate to ovate-oblong, 5 to 6 mm. long; styles long; stylopodia conical; ribs filiform; oil-tubes solitary in the intervals; seed face involute, inclosing a small cavity.

Collected by Mr. E. W. Nelson on northwest side of the summit of Mount Zempoaltepec, altitude 10,000 to 11,000 feet, June 9, 1894 (No. 643); altitude 8,000 to 10,000 feet, July 10, 1894 (No. 664); Reyes, altitude 7,500 to 10,000 feet, October 17, 1894 (No. 1734); summit of Sierra de San Felipe, altitude 10,500 feet, August 20 to 30, 1894 (No. 1119); also by Mr. C. G. Pringle, May 22 and August 4, 1894 (No. 4644).

This hitherto very rare plant has been collected in great abundance by these two diligent collectors. It has long been a desideratum in American herbaria, and until recently sent in by Capt. John Donnell Smith has been unrepresented in the National Herbarium. This monotypic genus was first collected in the Andes of South America, and has since been found on the summits of the highest mountains in Mexico and Central America. The plant was originally described by Humboldt, Bonpland & Kunth, but apparently without mature fruit. The illustrations of fruit and carpel are very unsatisfactory, as they give a very erroneous idea of the seed, ribs, and stylopodium. The genus was originally referred near to Œnanthe, and by Bentham & Hooker was placed in the subtribe Scandicineæ. Its relationships are much nearer Arracacia, from which it scarcely differs, except in its peculiar leaves and white flowers.

Prionosciadium megacarpum Coult. & Rose, sp. nov.

Stem 2.4 to 4.5 meters high; radical leaves (2 or 3) 9 to 12 dm. long and nearly as broad, thrice ternate; leaflets large, 15 to 20 cm. long, ovate, acute, crenately toothed with a small apiculation, paler and pubescent beneath; upper leaves opposite, twice ternate; leaflets lanceolate, acute, cuneate at base, hispidulous above, villous beneath; peduncles verticillate; involucel bractlets several, linear, scarious; flowers white; fruit large; carpels oblong, 14 to 20 mm. long, obtuse, notched at base, with narrow body and broad thin wings; dorsal and intermediate ribs slightly winged; oil-tubes 3 in the interval, the central one much the larger, 6 on the commissural side; seed but slightly flattened dorsally, with narrow sulcus opening into a large central cavity, strongly indented beneath the oil-tubes.

Collected by Mr. C. G. Pringle on Sierra de San Felipe, altitude 7,500 feet, June 1 and October 10, 1894 (No. 4688).

Here also should be referred Andrieux No. 352, fide Hemsley in lit.

Prionosciadium linearifolium (Watson) Coult. & Rose; *Cicuta linearifolia* Watson, Proc. Amer. Acad. xxii, 415 (1887); *P. watsoni*, Watson in part, Proc. Amer. Acad. xxv, 150 (1890).

Dr. Watson, in publishing our species of this genus which bears his name, referred to it not only *Peucedanum mexicanum*, which was our type, but also *Cicuta linearifolia*. If the two species are the same, present usage would require the substitution of the name *linearifolium*. A careful study of our material shows evidence of two fairly well-marked species, one of which is found east and the other west of the Sierra Madre.

The eastern species, which is based upon *Peucedanum mexicanum* Watson, may very properly bear the name of Dr. Watson as we had intended, with the following synonymy: *Prionosciadium watsoni* Coult. & Rose; Watson, Proc. Amer. Acad. xxv, 150 (1890), in part; *Peucedanum mexicanum* Watson, Proc. Amer. Acad. xvii, 361 (1882).

Prionosciadium sp.

Herb 3 to 5 feet high. Only seeds obtained. Collected by Mr. E. W. Nelson on the road between Tlapa and Tlaliscatilla, Guerrero, altitude 3,900 to 4,500 feet, December 5, 1894 (No. 2051)

Rhodosciadium dissectum Coult. & Rose, sp. nov.

Stems from fusiform roots, 3.5 to 7.5 dm. high; leaves ternately dissected, ultimate segments linear, entire or few-toothed, glabrous above, scabrous beneath on the veins, as also the petioles and rachis; involucre wanting; involucels few, linear, a little longer than the pedicels; rays of the umbel few (3 to 6), short (12 to 18 mm. long); flowers purple; wings of the fruit rather unequal, often very narrow or becoming as broad as body.

Collected by Mr. C. G. Pringle on calcareous hills, Las Sedas, altitude 6,000 feet, August 2, 1894 (No. 4764).

Rhodosciadium glaucum Coult. & Rose, sp. nov.

Stem from somewhat tuberous roots, 9 dm. high, purplish and somewhat glaucous, glabrous throughout, or in some species more or less scabrous; radical leaves sometimes on petioles 3 dm. or more long, with leaflets often 7.5 to 10 cm. long; stem leaves twice or thrice ternate; leaflets lanceolate, sharply serrate, acuminate, 5 cm. or less long; upper leaves much reduced, the inflated scarious petiole appearing conspicuously; inflorescence much branched, irregular, peduncle either wanting or more or less elongated; flowers yellow; involucre of broad scarious bracts tipped with linear leaf-like appendages; involucel bractlets filiform, longer than the pedicels; rays somewhat unequal, 2 to 3.7 cm. long; pedicels 6 mm. long; fruit 6 to 8 mm. long.

Collected by Mr. C. G. Pringle on foothills above Oaxaca, 7,000 feet altitude, June 20, 1894 (No. 5539); hills above Sierra de San Felipe, August 23, 1894 (No. 4823), and Salome Canyon, altitude 4,000 feet, November 2, 1894 (No. 5541); also by Mr. E. W. Nelson, near Reyes, altitude 6,000 to 7,500 feet, October 17, 1894 (No. 1711); Valley of Oaxaca, altitude 6,000 feet, September 20, 1894 (No. 1434); also by Rev. Lucius C. Smith, at the Rancho de Calderon, 5,000 feet altitude, September 10, 1894 (No. 255).

Rhodosciadium glaucum lineare Coult. & Rose, var. nov.

Like the type, but with more simple leaves, the leaflets linear with remote teeth. It appears to be connected with the type through certain forms of Mr. Pringle's No. 4823. Collected by Mr. E. W. Nelson in the Valley of Oaxaca, at the base of Sierra de San Felipe, September 1, 1894 (Nos. 1189 and 1193), and a single specimen obtained by Mr. C. G. Pringle, June 20, 1894, from the mountains of Oaxaca, altitude 7,000 feet, with No. 5539.

Spananthe paniculata Jacq. Coll. iii, 247 (1789).

Collected by Mr. E. W. Nelson in the vicinity of Choapam, 3,800 to 4,500 feet altitude, July 28 and 29, 1894 (No. 905); and between Tlapa and Ayusinapa, Guerrero, 4,500 to 5,700 feet altitude, December 13, 1894 (No. 2101).

Tauschia nudicaulis Schlecht. Linnæa, ix, 608 (1834).

Low caulescent or acaulescent, much branched at base from a long slender taproot; radical leaves forming a rosette at the base of the stem, once or twice pinnate; leaflets 6 to 18 mm. long, strongly toothed or cleft; peduncles slender, 2.5 cm. or less long; involucre wanting; bractlets of the involucels several, rather conspicuous, 3-cleft and the lobes often toothed or cleft; pedicels short, 2 mm. long; fruit oblong, obtuse, 4 mm. long; styles long, stylopodia wanting; oil-tubes solitary in the intervals, occasionally a shorter accessory one, 4 on the commissural side; seed strongly involute, with closed sinus and inclosing a central cavity.

Collected by Mr. C. G. Pringle in the State of Mexico on Sierra de las Cruces, altitude 10,000 feet, August 23, 1893 (No. 5210), and July 25, 1894 (No. 4744).

The genus *Tauschia*, based on the above species, is very near certain forms of Arracacia, especially *A. decumbens*, *A. edulis*, and *A. mariana*. If the genus is retained these species must undoubtedly be referred to it.

Tauschia coulteri Gray, as shown above is a good Arracacia, while *T. texana* is the type of the genus Museniopsis.

DESCRIPTIONS OF PLANTS, MOSTLY NEW, FROM MEXICO AND THE UNITED STATES.

By J. N. Rose.

The descriptions here brought together have been drawn up from time to time in connection with miscellaneous determinations. The types of all my new species are deposited in the United States National Herbarium. The paper also includes descriptions of new species of Malvaceæ by Mr. E. G. Baker of the British Museum, and of Cucurbitaceæ by Prof. A. Cogniaux of Verviers, Belgium.

NEW SPECIES FROM MEXICO.

Sida cinerea Baker fil., sp. nov.

Tota cinerea, caule vel ramo ligneo virgato tereto erecto, foliis cordato-ovatis acuminatis serratis petiolatis utrinque tenuiter stellato-pubescentibus, floribus axillaribus et ad apicem aggregatis pedunculis foliis brevioribus, calyce tubo tereto vel subtereto laciniis ovatis acuminatis, petalis obovatis (in sicco aureis) calyce parce longioribus, carpeliis 7 dorso rotundatis vel parce applanatis brevissime bicuspidatis.

Habitat, Mexico. Tepic. Dr. E. Palmer. No. 1835. Gathered between January 5 and February 6, 1892.

Stem or branches virgate, cinereous, terete, woody; leaves membranous, cordate, ovate, acuminate, serrate, 1 to 2 inches long, $\frac{3}{4}$ to $1\frac{3}{4}$ inches broad, petioles $\frac{1}{2}$ to $1\frac{1}{4}$ inches long; stipules linear lanceolate, rather more than $\frac{1}{4}$ inch long; flowers axillary and terminal, generally aggregated, rarely solitary or subsolitary, peduncles shorter than the leaves; calyx $\frac{1}{4}$ inch long, tube terete or subterete, cinereous and covered with pilose hairs, sepals ovate, acuminate; petals obovate, slightly longer than the calyx; carpels 7, very shortly beaked, rounded or slightly flattened at the back, sparsely pubescent, about 1 line long.

This plant is allied to *Sida dumosa* Sw.

Sida lodiegensis Baker fil., sp. nov.

Caule erecto ramoso tereto perenne minute stellato-pubescente, foliis lanceolatis vel lineari-lanceolatis basi cuneatis serratis viridis superne glabris vel glabriusculis subtus minute stellato-pubescentibus breviter petiolatis, stipulis linearibus floribus axillaribus solitariis interdum fere racemosis, calyce externe stellato-pubescente tubo tereto laciniis ovatis acutis, petalis obovatis calyce longioribus (in sicco roseis) columna staminea glabra, carpellis 5.

Habitat, Mexico. Lodiego. Dr. E. Palmer. No. 1577. Collected between October 9 and 15, 1891.

Stem $1\frac{1}{2}$ feet high, possibly more, perennial, terete, copiously branched, covered with fine stellate pubescence; leaves 1 to $2\frac{1}{2}$ inches long, $\frac{1}{5}$ to $\frac{1}{2}$ inch broad, lanceolate or linear-lanceolate, green, membranous or submembranous, 3-nerved at the

base, middle vein penninerved, petiole about 2 lines long, apex of leaf acute or subacuminate, serrate, stipules linear, ¼ to ½ inch long; flowers axillary, solitary or subsolitary; peduncles slender, about ¼ inch long or at the apex of the branches the flowers are subsessile or sessile—on some of the lateral branches the inflorescence is almost racemose; calyx tube terete, sepals ovate, acute or subacuminate, externally finely, minutely stellate; petals obovate (when dried rose-colored), not quite 2 lines long; staminal column glabrous; styles capitately stigmatose; carpels 5, only seen when quite young, then hairy and not aristate.

Allied to *Sida paniculata* L.

Wissadula pringlei Rose, sp. nov.

Branches, petioles, pedicels, and calyx pilose, the hairs intermixed with a short, close, and somewhat glandular pubescence; leaves cordate, acuminate with a deep narrow, sometimes closed sinus, crenate, long, loosely stellate or pilose above, densely stellate beneath; petiole 3.5 to 5 cm. long; stipules filiform, caducous; flowers axillary or in somewhat leafy panicles; peduncles 2 to 4 cm. long, jointed a few millimeters below the flower; calyx about 8 mm. long, somewhat enlarged in fruit and as long as the carpels, cleft to the middle, the lobes ovate, acute; petals light-yellow, longer than the sepals; carpels 5, 8 mm. long, including the aristate tip, 2-celled; lower cells narrower, of different texture from the upper, 1-seeded; upper cells inflated, 2-seeded.

Collected by Mr. C. G Pringle in the State of Oaxaca in 1894 (No. 4872).

Very much resembling *Bastardia berlandieri* in habit and foliage, but very different in fruit.

Abutilon membranaceum Baker fil., sp. nov.

Radice simplice fibroso, caule erecto tereto ligneo, foliis cordato-ovatis acuminatis membranaceis viridibus grosse serratis interdum biserratis utrinque sparse stellato-pubescentibus petiolatis, petiolis laminis brevioribus vel subæquilongis versus apicem petiolis laminis multo brevioribus, floribus axillaribus solitariis vel versus apicem parce aggregatis, pedunculis gracilibus juxta florem articulatis, sepalis ovatis acuminatis carpellis multo brevioribus, petalis (in sicco flavidis) calyce duplo longioribus, carpellis 5 apiculatis externe stellato-scabridis 3-spermis.

Habitat, Mexico. Tepic. Dr. E. Palmer. No. 1959. Collected between January 5 and February 6, 1892.

Root simple, fibrous; stem erect, 1 to 1½ feet high, possibly higher, woody, rather slender, terete, slightly pubescent; leaves cordate, ovate, acuminate, membranous, 2 to 3½ inches long, 1½ to 2¾ inches broad, serrate, sometimes biserrate, petioles generally shorter than the lamina, above much shorter than the lamina, terete, finely stellately scabrid, lamina palmately 5-nerved, finely stellately pubescent on both surfaces; flowers axillary, solitary or toward the apex somewhat aggregated; peduncles slender, terete, articulated near the flower, above the articulation rather more pubescent than below, often bent at the articulation; calyx pubescent externally; sepals ovate, acuminate, about as long as the tube, much shorter than the fully ripe carpels; petals obovate above ⅝ inch long, staminal column ¼ inch long, hairy below; carpels 5, apiculate, externally stellately scabrid, nearly ½ inch long, 3-seeded; seeds black, smooth.

This plant is very nearly identical with *Sida dumosa* Seeman non Swartz, collected by Seeman in Panama (No. 2146).

Abutilon wissaduloides Baker fil., sp. nov.

Caule vel ramo ligneo tereto foliis cordato-ovatis acuminatis serratis vel crenato-serratis 7–9-palmatinervatis membranaceis viridibus utrinque tenuiter pubescentibus subtus paullo pallidioribus infra petiolis laminis longioribus vel subæquilongis, floribus paniculatis paniculis foliosis laxis, pedunculis gracilibus teretibus plus minusve glanduloso-pilosis, calycibus externe glanduloso-pilosis, sepalis triangularibus acutis in mediam carinatis, petalis obovatis (in sicco violaceis), columna staminea

brevissima carpellis in capsulam loculicidem connatis triovulatis apice muticis versus basin paullo constrictis.

Habitat, Mexico. Ymala. Dr. E. Palmer. No. 1720. Sept. 25 to Oct. 8, 1891.

Stem or branches woody, terete or subterete, glaucous, green, pubescent; leaves cordate, ovate, acuminate, about 3 inches long by 2½ inches broad, crenately serrated, petioles longer than the lamina; panicle lax, leafy; pendunoles and calyx externally pilose and somewhat glandular; sepals triangular, acute, with a medial ridge; petals obovate, about ⅛ inch long; staminal column very short; carpels 3, united so as to form a loculicidally dehiscing capsule, which is muticous and slightly constricted near the base.

This plant is closely related to *Abutilon bastardioides*. The calyx is smaller and not nearly so much covered with brown pubescence. The staminal column is very much shorter and the carpels are fewer in number and constricted near the base.

Malvaviscus palmeri Baker fil., sp. nov.

Ramis ligneis, foliis cinereis vel cinereo-viridibus cordatis 3–5-palmatilobatis, lobo medio majore serratis petiolatis, floribus racemosis versus apicem congestis sessilibus vel subsessilibus racemis axillaribus et terminalibus, bracteolis linearibus calyce longioribus, sepalis triangularibus acutis vel acuminatis in medio carinatis petalis obovatis externe pubescentibus columna staminea exserta carpellis 5 dorso carinatis 1-spermis.

Habitat, Mexico. Tepic. Dr. E. Palmer. No. 1990. Jan. 5 to Feb. 6, 1892.

Branches woody; leaves cordate, palmately 3- to 5-lobed, lobes acute, larger leaves on specimen 5 inches long by about the same broad, cinereous, rather lighter-colored below, finely stellately pubescent, the same below with the addition of stellate, stiff 4-radiate hairs, petioles ¼ inch long, possibly more; flowers racemose, racemes axillary and terminal, many-flowered, flowers closely aggregated and sessile or subsessile near the top, lower down longer peduncled and more laxly aggregated; bracts 9 to 10, linear, slightly longer than the calyx; calyx triangular, acute or acuminate; petals not unguiculate, ½ inch long; staminal column exserted, ¼ to ½ inch long; carpels 5, ridged on the back and pubescent, nearly 4 lines long, edges acute.

I thought at first this might be *M.? flavidus* of De Candolle's Prodromus, but it differs from this species completely in its inflorescence, that is, if I have rightly interpreted this latter species. In the Mocino and Sessé drawings there is no figure of *M. flavidus*, but there is one of *Hibiscus flavidus*, which name, however, does not appear in the Prodromus. The description in the Prodromus of *M. flavidus* agrees with the figure of *H. flavidus*. Mons. Casimir de Candolle and Mons. Buser, to whom I am indebted for a tracing of the plant, suggest that they must be the same plant, with which suggestion I fully agree.

Galphimia sessilifolia Rose, sp. nov.

Low shrub, 3 to 9 dm. high, usually with stunted branches and internodes shorter than the leaves, in vigorous shoots the internodes twice as long as the leaves, glabrous throughout except the inflorescence; leaves sessile, glabrous and glaucous on both sides, ovate, 1.6 to 3.6 cm. long, acute; racemes either terminal or lateral, 5 to 12.5 cm. long; pedicels often slender, 6 to 20 mm. long; bracts 1, small, setaceous; bractlets 2, borne on the pedicels, alternate, minute; buds reddish; sepals glabrous or nearly so, oblong, obtuse, 3 mm. long, much shorter than the claw of the petals; petals yellow, tinged with red, 8 to 10 mm. long, including the slender claw.

Collected by Mr. C. G. Pringle in the State of Oaxaca in 1894 (No. 4901).

Bursera glabrescens (Watson) Rose; *B. palmeri glabrescens* Watson, Proc. Amer. Acad. xxv, 145 (1890).

Shrub or small tree, 3.6 to 7.5 meters high, with dark-brown or blackish bark; leaflets 5 to 10 pairs, small, 4 cm. or less long, rarely 12 mm. wide, oblong, very rugose and becoming nearly glabrous above, strongly reticulated and pubescent beneath; rachis with narrow wings; inflorescence very much contracted, but racemes

(including peduncle) often 25 to 38 mm. long; fruit 6 mm. in diameter; nutlet orange, spherical.

This species seems to be clearly distinct from *B. palmeri*. The latter species has recently been collected near Manzanillo and in Guatemala. These specimens, although from widely separated regions, do not show much variation from the type. Mr. Nelson's specimens vary little from Dr. Watson's variety *glabrescens*, and we feel justified in separating it specifically from *B. palmeri*. It differs especially from the latter in its darker bark, in the shape, size, number, pubescence, and texture of the leaflets, and apparently in having smaller fruit.

The type is deposited in Gray herbarium, duplicate type in National Herbarium.

It was collected by Mr. C. G. Pringle on the rocky bluffs of the Rio Grande de Santiago, near Guadalajara, in October, 1889 (No. 2336). Mr. Nelson's plant (No. 2031) was collected along roadside between Sochi and Tlalquesala, State of Guerrero, altitude 3,600 to 4,800 feet, November 29, 1894.

Bursera jonesii Rose, sp. nov.

Small shrub with slender, grayish branches; leaves simple, oval to obovate, rounded or slightly indented at apex, broadly cuneate at base, entire, 3 cm. or less long; flowers solitary on short, reflexed pedicels; fruit oval, 5 mm. in diameter.

Collected by Mr. Marcus E. Jones, near the city of Colima, July 2, 1892 (No. 73).

Mr. Jones says that the plant resembles *Rhamnus crocea*.

Bursera nelsoni Rose, sp. nov.

Leaves imparipinnate; leaflets 5 to 9, oblong to ovate, 8 to 16 mm. long, obtuse, rounded at base (the terminal one cuneate at base), crenately toothed above the middle, glabrous and shining above, strongly reticulated and nearly glabrous beneath; rachis 3.6 to 5 cm. long, silky-pubescent especially below, narrowly winged between the leaflets; fruit solitary on long slender peduncles 16 mm. long, obovate, obtuse, 8 mm. long.

Atlixco, Puebla, Mexico. Collected by Mr. E. W. Nelson, July 25 to August 1, 1893. Apparently nearest *B. penicillata*, but differing in its narrowly winged rachis, inflorescence, etc.

B. fagaroides resembles this somewhat, but has very congested inflorescence, and dull, glabrous leaves.

Bursera tenuifolia Rose, sp. nov.

Small tree, 7.5 meters high, 2.5 to 3 cm. in diameter, glabrous throughout; leaves often clustered at the ends of short, stunted branches; leaflets 7 to 15, narrowly lanceolate, acute, cuneate at base, 1.2 to 3.6 mm. long, entire or slightly crenate; rachis 12 to 50 mm. long, slightly winged; flower clusters 1- to 3-flowered, several in the axil of the leaves, peduncle and pedicels very short; fruit 6 mm. long, 3-valved.

Common on stony mountains. Collected by Dr. Edward Palmer, Lodiego, October 9 to 15, 1891 (No. 1581).

The tree has considerable top. When cut it exudes a gum-like substance with the odor of varnish.

This species seems nearest *B. fragilis* and *B. pringlei*.

Mr. C. G. Pringle's No. 4372, distributed as *B. lancifolia* Engler, appears to belong here. It seems to differ from that species in its slightly winged rachis, and fewer and narrower leaflets.

Gouania mexicana Rose, sp. nov.

A climbing shrub; branches, leaves, calyx and fruit softly tomentose; leaves oblong to ovate, acute, glandular crenate, short-petioled; racemes elongated; flowers with short pedicels or subsessile; disk glabrous; fruit 4 mm. high, 6 mm. broad; wings very narrow.

Seemingly a common species from Culiacan to Alamos in river bottoms, arroyos, and mountain passes. Collected by Dr. Edward Palmer, Culiacan, August 27 to September 25, 1891 (No. 1491); Ymala, September 25 to October 8, 1891 (No. 1694).

I would also refer here Palmer's Nos. 323, 675, and 676 from Alamos, distributed as *G. domingensis*. This species resembles *G. tomentosa*, but has very different fruit and leaves.

Colubrina mexicana Rose, sp. nov.

A small upright shrub, 1.2 to 2.4 meters high; young branches as well as petioles, under surface of leaves, pedicels, and calyx pubescent; leaves ovate, long-acuminate, rounded at base, 3-nerved, entire or with few teeth, 2.5 to 7.5 cm. long, including the short petioles (4 to 8 mm. long); flowers 4 to 10 on very short peduncles in the axils of the leaves, greenish-white, 4 mm. broad; petals and stamens glabrous; fruiting pedicels 6 to 12 mm. long; fruit dry, oval, 4 mm. in diameter; seeds flattened, 4 mm. long.

Rich bottom lands; not common. Collected by Dr. Edward Palmer, Culiacan, August 27 to September 15, 1891 (No. 1526).

To this species I would refer also Palmer's No. 112 (1885) from southwestern Chihuahua referred as "*C. glomerata* Hems.?" by Watson.[1]

This species is clearly distinct from *C. arborea* in its smaller, more acuminate, and more delicately veined leaves and smaller fruit, as well as in the size and habit of the plant.

Cormonema mexicana Rose, sp. nov.

A small tree, 3.6 meters high, 1.25 dm. in diameter, with stiff branches and axillary spines; leaves alternate, oblong to oblanceolate, 7.5 to 15 cm. long, including the petiole 10 to 14 mm. long, 36 to 65 mm. broad, slender acuminate, narrowly cuneate, biglandular at base, entire, glabrous at least in age, pinnately veined; flowers unknown; drupes large, mostly 2 in the axils of the leaves on pedicels about 12 mm. long.

Only two trees seen near the mouth of a canyon. Collected by Dr. Edward Palmer, Tepic, January to February 6, 1892 (No. 1977).

It differs from *Colubrina arborea*, for which it was mistaken at first in the field, by having erect branches, pinnately veined leaves, larger fruit, etc.

Cormonema has heretofore been restricted to a single Brazilian species, *C. spinosa*. The genus is near Colubrina, but differs from it in having spines and in the blade of the leaf being biglandular at base.

The genus is new to the National Herbarium.

Cormonema nelsoni Rose, sp. nov.

A tree, 4.5 to 6 meters high; older branches with large spines, younger branches clothed with brown hairs; leaves alternate, oval to shortly oblong, 5 to 7.5 cm. long including the petiole (6 to 12 mm. long), 25 to 35 mm. broad, retuse, the midrib slightly prolonged, rounded or broadly cuneate at base; the blade biglandular on the margin, slightly hairy on veins beneath, entire, pinnately veined: flowers numerous in the axils of the leaves, greenish-yellow; petals 5; ovary glabrous, 3-lobed, 3-celled; cells 1-ovuled; drupes smaller than the last.

Collected by Mr. E. W. Nelson near San Marcos, State of Guerrero, altitude 500 feet, February 7, 1895 (No. 2284); also by Dr. Edward Palmer near Lodiego, State of Sinaloa, October 9 to 15, 1891 (No. 1625).

This species differs from *C. mexicana* in having its branches almost at right angles to the stem, the leaves smaller, of different shape, and the glands on the blade remote from the petiole.

Cologania hirta (Mart. & Gal.) Rose; *Galactia hirta* Mart. & Gal. Bull. Acad. Brux. x, pt. 2, 190 (1843).

Stems twining to 12 dm. high, slender, retrorsely hirsute; leaflets oval or ovate, obtuse, yellowish, hirsute beneath, appressed-pubescent above; flowers clustered near the ends of elongated peduncles; bracts and bractlets lanceolate, rather conspicuous; calyx cylindrical, 5 lines long, slightly 2-lipped; the 2 upper teeth united; corolla crimson; banner 3 cm. long, tapering at base; keel much shorter, obtuse; fruit unknown.

[1] Proc. Amer. Acad. xxv, 422.

Collected by Mr. C. G. Pringle under oak trees in the Sierra de San Felipe, State of Oaxaca, altitude 8,000 feet, August 13, 1894 (No. 4793).

I have not seen specimens of *Galactia hirta*, but Mr. Pringle's specimens answer the description so well that I feel no hesitancy in identifying them with that plant. The species, however, clearly belongs to Cologania. The type, which was collected by Galeotti, was obtained from this same mountain in similar habitat, and at almost the same altitude (7,500 feet).

Rhynchosia pringlei Rose, sp. nov.

Stem 6 to 15 dm. high, erect, velvety-tomentose; leaflets 3, nearly orbicular, obtuse, rounded or slightly cordate at base, 2.5 to 6 cm. broad, strongly reticulated beneath, thickish, 3-nerved at base, softly pubescent; terminal leaflet distant; petiole short, 2.5 to 5 cm. long; stipules not seen; stipels minute; racemes axillary and short (3 to 7 cm. long) or terminal and paniculate, 25 cm. long; bracts large, ovate, acute, 8 mm. long, caducous; flowers large for the genus; calyx 12 mm. long, 5-toothed; the 2 upper teeth somewhat united, the 3 lower with acuminate tips, the middle one much longer; corolla normal, yellow or somewhat purplish, pod 2-valved, hirsute, falcate, 30 mm. long, 2- or 3-seeded; seeds flattened, blackish, attached at the middle.

Collected by Rev. Lucius C. Smith in the mountains of San Juan del Estado, State of Oaxaca, altitude 7,000 feet, November 4, 1894 (No. 265); by Mr. E. W. Nelson at the north end of the Valley of Oaxaca, October 13, 1894 (No. 1552); also by Mr. C. G. Pringle on dry limestone hills, Las Sedas, altitude 6,000 feet, September 15, 1894 (No. 4900).

Resembling Eriosema in flowers and habit, but with very different seeds. It is referred to Rhynchosia with some doubt. The leaves are unlike any species of this genus with which I am acquainted.

Mimosa spirocarpa Rose, sp. nov. PLATE XI.

Large shrub, 3 to 6 meters high, with velvety pubescence throughout and with small scattered prickles; leaves twice pinnate; pinnæ 4 to 5 pairs; leaflets 1 (below) to 3 pairs, oblique-oval, 16 to 30 mm. long, obtuse; spikes 7.5 to 12.5 cm. long, 2 to 4 in the axils of the leaves; petals valvate, connate below; stamens 10; pod closely spiraled, separating into several indehiscent joints.

Collected by Dr. Edward Palmer, Culiacan, August 27 to September 15, 1891, in flower (No. 1476); October 25 to November 18, 1891, in fruit (Letter H).

A very peculiar Mimosa and very unlike anything I have ever seen; but the technical characters at least are of this genus. Not only are the leaves peculiar, but also the pods. In the latter, however, the broad valves separate from the replum as in that genus. The ovary, which at first is nearly straight, as it ripens becomes curved and when mature forms a close coil. The pods readily separate into 5 to 7 segments; each segment contains one small black seed. I am not able to place it near any of the described species of Mimosa. The 10 stamens and cylindrical spikes locate it in Bentham's section, Leptostachyæ. The stems are 2 to 3 inches in diameter. Dr. Palmer writes that the plant is very showy; the long spikes, which are at first purplish, become white and are very abundant.

EXPLANATION OF PLATE.—Fig. *a*, flower; *b*, the same spread out showing pistil and position and number of stamens; *c*, legume, not quite mature; *d*, the same, mature and separating into sections; *e*, section of the same showing the inner side. Figs. *a* and *b* are enlarged 8 diameters; *c*, *d*, and *e*, 2 diameters.

Acacia pringlei Rose, sp. nov.

An upright tree, 6 to 9 meters high; branches with grayish bark covered with numerous small lenticels; leaves with a single pair of pinnæ; leaflets in 2 pairs, large, 25 to 40 mm. long, nearly orbicular, somewhat oblique at base, rounded at tip, veins conspicuous, nearly glabrous in age, apparently more or less pubescent when young; common petiole short, 12 mm. long or less, bearing a cup-shaped gland near the middle; stipules of short, straight spines; flowers in long, slender spikes,

MIMOSA SPIROCARPA Rose.

7.5 to 10 cm. long; spikes 5 or 6 in the axils of the leaves; involucre at the base of the peduncle, 4-lobed and striate; flowers numerous; stamens yellow, indefinite, distinct or slightly cohering at base; pod not seen.

Collected by Mr. C. G. Pringle in the Tomillin Canyon, altitude 3,000 feet (No. 6113). I am also inclined to refer here Mr. Nelson's No. 2056, although the specimens are so young it is difficult to be certain. Mr. Nelson's plant was collected along the road between Tlaliscatilla, Guerrero, and Tlapancingo, Oaxaca, December 6, 1894.

This species, which is well marked by its large leaflets and long flowering spikes, appears to belong to Bentham's series Gummiferæ, subseries Basibracteatæ, and near the species *spadicigera* and *amentacea*. It differs from both of these very greatly in its foliage. Its leaflets are much like those of *A. reniformis*, but the stipules are very different and the spikes longer.

Eucnida grandiflora (Groenland) Rose; *Microsperma grandiflora* Groenland, Rev. Hortic. 1861, 349, t. 84 (1861).

Herb, 6 to 12 dm. high, pubescent with barbed hairs; leaves alternate, orbicular, cordate at base, obtuse, 3- to 5-nerved, with rounded obtuse lobes, crenate, pubescent on both sides, 6 to 15 cm. in diameter; petioles about the length of the diameter of blade; flowers solitary, 5 to 10 cm. long; calyx cup-shaped, 18 mm. high, clothed with echinate hairs; lobes long (4 cm.), tapering from the base to an acute tip, simply pilose; petals white, oblong, 6 cm. long, acute and villose without; stamens very numerous, much longer than the petals, 10 cm. long; filaments marked with a spiral thread; styles 13 cm. long.

This is a very distinct species and by far the largest-flowered one of the genus. Nearest *E. bartonioides*, but with flowers twice as large, different pubescence and different toothing of the leaves.

Collected by Mr. E. W. Nelson 6 miles above Dominguilla, State of Oaxaca, altitude 5,000 to 6,000 feet, October 3, 1894 (No. 1589); also by Mr. C. G. Pringle (No. 4645).

We have not seen specimens of *Microsperma grandiflora*, but from the description and figure there seems to be no doubt of our reference.

The species was originally collected by a Mexican traveler, Mr. Roezl, from whom it was received about 1860 by Vilmorin, Andrieux & Co., who introduced it into Europe. It was described and figured in the Revue Horticole by Groenland and spoken of from the florist's point of view in the most glowing terms. The following is a translation in part of his remarks:

"Aside from the remarkable beauty of this new species, we have full assurance that from the close of the month of May up to the present time it has been constantly in flower; even at this moment (beginning of September) it still bears flower buds in as large numbers as in the month of June, so that presumably it does not rest before winter. Ought not this quality alone to recommend it warmly to the attention of our readers?

"A glance at figure 84, which represents *Microsperma grandiflora* at one-fourth its natural size, suffices moreover to show that it is of a quite uncommon beauty. The numerous stamens which are consolidated at the base, and which far exceed the ample corolla, are of a perfect elegance; the color of the petals is not yellow, as in the species hitherto known, but pure white with a light-greenish tint on the outer face; the flowers, which during blossoming are erect, afterwards turn in such a way that the fruits are pendent; the alternate, long-petioled leaves, which in their form much resemble those of *Microsperma bartonioides*, are, however, more indented and more undulate on the margin; they are, like the stem, covered with a thick down of short hair."

Apodanthera roseana Cogn. (sect. Cucurbitopsis); foliis satis parvis, longiuscule petiolatis, leviter vel usque ad medium trilobatis, latioribus quam longis, utrinque brevissime et densiuscule calloso-asperis præcipue subtus; petiolo gracili, brevissime subsparseque hirtello; cirrhis geminatis, simplicibus vel bifidis; pedunculo communi masculo bifloro vel interdum unifloro; calyce brevissime subsparseque hirtello,

tubo subcylindrico, inferne breviuscule attenuato, dentibus subulatis, tubo paulo brevioribus.

Rami graciles, sulcati, brevissime sparseque hirtelli interdum subglabri. Petiolus striatus, 2–4 cm. longus. Folia rigidiuscula, supra læte viridia, subtus paulo pallidiora, plana vel subplana, margine minute remoteque denticulata, 2–5 cm. longa, 3–6 cm. lata; nervi graciles, subtus leviter prominentes, duo laterales inferne imum sinum marginantes; sinus basilaris subrectangularis ½–1½ cm. latus et profundus. Cirrhi subfiliformes, brevissimi, sulcati, vix hirtelli. Pedunculus communis masculus gracilis, striatus, sparse hirtellus vel glabratus, 4–8 cm. longus; pedicelli erecti, brevissime subsparseque hirtelli, 1–2 cm. longi; bracteolæ subulatæ, erectæ, leviter hirtellæ, 3–6 mm. longæ. Calyx cinereofuscus; tubus ad apicem leviter dilatatus, 8–9 mm. longus, ad medium 2½ mm. et ad apicem 4 mm. latus; dentes erecto-patuli, leviter flexuosi, 7–8 mm. longi, basi ½ mm. lati. Petala late oblonga, acuta vel breviter acuminata, 5-nervia, vix puberula præcipue ad nervos, 20–22 mm. longa, 6–10 mm. lata. Antheræ biloculares oblongo-rectangulares, 4 mm. longæ, 1 mm. latæ, loculis rectis apice leviter incurvis, connectivo non producto. Flores feminei ignoti. Pedunculus fructiferus subglaber, sulcatus, 4–5 cm. longus. Fructus late ovoideus, ut videtur ruber, lineis atro-fuscis numerosis longitudinaliter vittatus, 4 cm. longus, 3–3½ cm. crassus. Semina fusca, obovata, lævia, obscure marginata, 6 mm. longa, 4 mm. lata, 1½ mm. crassa.

Species *A. asperæ* Cogn. proxima. Dr. E. Palmer. No. 1444. Ymala, August, 1891.

Cyclanthera micrantha Cogn. (sect. Eucyclanthera); caule glaberrimo vel ad nodos vix pilosulo; petiolo apice tripetiolulato; foliis trifoliolatis; foliolis basi longe attenuato-petiolulatis, lobatis, obtusis et breviter mucronatis, mediano anguste ovato vel obovato, lateralibus profunde vel sæpius usque ad basim bifidis; cirrhis plerumque inæqualiter bifidis; floribus masculis minutissimis, in racemos simplices apice subumbellatim 7–10-floros foliis sæpius breviores digestis; floribus femineis brevissime pedicellatis; fructu longissime subsparseque echinato, apice in rostrum acutum brevem producto.

Caulis subfiliformis, ut videtur 3–4 dm. altus, paulo ramosus, angulato-sulcatus. Petiolus filiformis, striatus, glaber, 1–2½ cm. longus; petioluli vix puberuli, patuli, terminalis 6–10 mm. longus, laterales satis breviores. Foliola tenuiter membranacea, supra læte viridia et tenuissime punctato-scabra, subtus paulo pallidiora et sublævia, terminale 2–3 cm. longum et 10–18 mm. latum, lateralia paulo breviora. Cirrhi capillares, elongati, sulcati, glabri. Pedunculus communis masculus capillaris, sulcatus, glaber, 1½–3 cm. longus, pedicelli 1–3 mm. longi. Calyx rotatus, glaber, tubo vix 1 mm. lato, dentibus subulatis, brevissimis. Corolla albescens, segmentis ovatis, acutis, uninerviis, ⅔ mm. longis. Anthera ⅔ mm. lata. Pedunculus fructiferus gracilis, glaber, teres, 3–5 mm. longus. Fructus anguste ovoideus, basi oblique satis gibbosus, 17–18 mm. longus, 8–10 mm. crassus; aculei setiformes, paulo compressi, 6–11 mm. longi. Semina cinereo-fusca, subquadrata, basi longiuscule obtuseque appendiculata, apice leviter trilobata, margine truncata, utrinque verruculosa, 6 mm. longa, 3–4 mm. lata, 1 mm. crassa.

Species *C. gracillimæ* Cogn. proxima. Dr. E. Palmer. No. 1706. Ymala, 1891.

Elaterium longisepalum Cogn.; foliis supra sublente subtiliter sparseque asperis, subtus glaberrimis lævibusque, ambitu ovatis, 5-angulatis vel obscure trilobatis, apice obtusiusculis et brevissime mucronulatis, sinu basilari brevissime ciliato; cirrhis bifidis; floribus 5-meris, masculis in racemos subumbelliformes 3–6-floros brevissimos digestis; calycis tubo breviusculo, petalis paulo longiore, dentibus reflexis, longissimis, capillaribus.

Rami gracillimi, angulato-sulcati, glabri. Petioli filiformes, striati, glabrati, inferiores 3 cm. longi, superiores brevissimi. Folia tenuiter membranacea læte viridia, margine leviter undulato-denticulata, 4–5½ cm. longa et lata; nervi tenuissimi, subtus vix prominentes, duo laterales basilares bifurcati, imum sinum non marginates; sinus basilaris angustissimus, obtusus, 1–1½ cm. profundus. Cirrhi gracillimi, elon-

gati, sulcati, glabri. Pedunculus communis masculus (imperfecte evolutus) subnullus; pedicelli erecto-patuli, capillares, 2–3 mm. longi. Flores feminei brevissime pedunculati. Calycis tubus basi truncatus, apice paulo dilatatus, 8 mm. longus, 1–1½ mm. latus; dentes flexuosi, 3 mm. longi. Petala patula vel subreflexa, basi leviter dilatata, superne subulata, 6 mm. longa. Ovarium oblique ovoideo-oblongum, longissime denseque hirsutum, 3–4 mm. longum. Fructus maturus ignotus.

Dr. E. Palmer. No. 1600. Lodiego, October 9 to 15, 1891.

Sicyos echinocystoides Cogn. (sect. Eusicyos); foliis breviuscule petiolatis, ambitu late cordato-ovatis, obscure vel leviter 3–5-lobatis, utrinque scaberrimis, lobis triangularibus vel subrotundatis, nervis lateralibus imum sinum non marginantibus; cirrhis trifidis; racemis masculis simplicibus, 15–25-floris, folio satis longioribus; calycis dentibus brevissimis; pedunculis femineis apice 4–5-floris; fructibus valde inæqualibus, plurisque parvis abortivis, sæpius uno tantum bene evoluto, ovoideo, satis compresso, obtusiusculo, vix puberulo et setis elongatis persistentibus densiuscule vestito.

Rami gracillimi, sulcati, brevissime subsparseque glanduloso-puberuli. Petioli satis graciles, striati, brevissime denseque glanduloso-puberuli, inferiores 3–4 cm. superiores sæpius vix ½ cm. longi. Folia tenuiter membranacea, læte viridia demum pallidiora, margine minime remoteque denticulata, 8–12 cm. longa, 7–10 cm. lata, superiora multo minora; nervi subtus paulo prominentes; sinus basilaris angustus, 1–2½ cm. profundus. Cirrhi satis graciles, longiusculi, sulcati, brevissime sparseque glanduloso-puberuli. Pedunculus communis masculus gracilis, striatus, brevissime et densiuscule glanduloso-puberulus, circiter 1 dm. longus, usque ad medium floriferus; pedicelli filiformes, patuli, 5–8 mm. longi. Calycis tubus subrotatus, subglaber, 2½ mm. latus; dentes patuli, triangulari-subulati, vix 1 mm. longi. Corolla spurco-alba, vix puberula, segmentis patulis, triangularibus, acutis, 5-nerviis, 4 mm. longis, basi 2 mm. latis. Columna staminea capillaris, 2½ mm. longa; antheræ conniventes, 1 mm. longæ. Flores feminei quam masculi multo minores. Pedunculus fructiferus 1–1½ cm. longus. Fructus fuscescens, basi rotundatus, 10–11 mm. longus; setæ 4–9 mm. longæ, basi interdum tuberculatæ.

Species *S. deppei* G. Don proxima. Dr. E. Palmer. No. 1894. Tepic, 1892.

Tridax tenuifolia Rose, sp. nov.

Annual, 6 to 9 dm. high, erect and somewhat simple, or spreading and much branched, slightly hispid throughout but not glandular; leaves opposite, thin, ovate-lanceolate, sharply and more or less strongly serrate, acute, cuneate at base, 10 cm. or more long including the slender petioles, rather variable in size, 8 to 12 mm. high; involucre double; outer bracts 5, green, oblong, acuminate, strongly striate; inner bracts scarious, equal to the outer; paleæ of the receptacle shortly acuminate; rays white; bristles of the pappus white. Type specimens collected by Dr. Edward Palmer on mountain sides above Batopilas, State of Chihuahua, Mexico, August to November, 1885 (No. 130) and distributed as *T. bicolor*, Proc. Amer. Acad. xxi, 391 (in part), 433. Type specimen deposited in the National Herbarium.

This species is quite distinct from *T. bicolor*. It differs in the texture and shape of the leaves, in the involucral bracts, color of the rays, the acumination of the chaff, the color and length of the pappus, and the shape of the disk corollas.

Dr. Palmer has also collected near Lodiego (October 9 to 15, 1891, No. 1611) a very similar plant with smaller heads, slightly different disk corolla, which I here designate variety **microcephala**. Future study may show that the two are distinct.

THREE UMBELLIFERÆ OF THE WESTERN UNITED STATES.

One of the most puzzling of our American Umbelliferæ outside of some of the Rafinesquian species has been the *Angelica verticillata* of Sir William J. Hooker. He published this species in 1847 as a doubtful

Angelica, Geyer having previously sent it to him as a species of Thaspium. Walper[1] follows Hooker in retaining the species in Angelica. Mr. Watson[2] first calls attention to the improbability of its being an Angelica. No additional information could be obtained when Coulter and Rose's Revision of Umbelliferæ was written, and so the species was again doubtfully referred to Angelica. Geyer collected his plant in the Nez Perces Indian Reservation in 1841 (?), and, since no botanical collector had visited this region later, it was impossible to associate the description with any known species. The habit of the plant suggested to me Ligusticum, but I repeatedly failed to convince myself that it belonged in that genus. In 1892 Messrs. Sandberg, MacDougal, and Heller spent some time on the Nez Perces Indian Reservation, and it was therefore with considerable interest that I looked over their collection of Umbelliferæ. It was found to contain a plant which is undoubtedly the *Angelica verticillata* of Hooker and which must be a Ligusticum. We are accordingly warranted in adopting the following:

Ligusticum verticillatum Hook.) Coult. & Rose; *Angelica verticillata* Hook. Lond. Journ. Bot. vi, 233 (1847). PLATE XII.

Hooker's notes and description are as follows:

"Shady grassy borders of pine woods, on high plains of the Nez Perces Indians. June (n. 414). Of the genus of this I am exceedingly doubtful. The immature fruit and leaves are not unlike those of some Angelica; but there are no large sheathing bases to the petioles. My specimens are very imperfect. They consist of a fusiform root, clothed, especially above, with dense, coarse, long fibers, the remains of former petioles; there is only one root leaf, the main petiole of which is about a span high, semiterete, channeled, striated, glabrous, as is the whole plant. This divides into 3 at the top, and each of those again into 3, bearing generally 5 oblong-ovate, membranous leaflets, opposite and slightly petiolate; the extremity of a flowering branch has a whorl of about 4 pinnated and laciniated, sessile, small (2 to 3 inches long) leaves, within which is an umbel of 6 rays; the center ray is twice as long and 4 or 5 times as stout as the others, each bearing an umbel of many petiolated umbellules of fertile flowers, yellowish-white, the stylopodia very large, much broader than the ovary; the other 5 rays are sterile (having no trace of pistil), and are each terminated by a compound sterile umbel, the whole forming a whorl around the central ray, whence Mr. Geyer's specific name. There is besides a separate fertile umbel, with very immature, deeply sulcated, obovate fruit. The umbels and umbellules have no involucral scales."

EXPLANATION OF PLATE.—Fig. *a*, dorsal view of carpel, enlarged 5 diameters; *b*, cross section of carpel, enlarged 10 diameters.

Ligusticum eastwoodæ Coult. & Rose, sp. nov. PLATE XIII.

Low acaulescent plant from a short caudex; scape 10 to 30 cm. high, glabrous; leaves pinnate, 10 to 15 cm. long; pinnæ 7 to 13, opposite, oval, 2- to 3-lobed and lobes 2- to 3-cleft into linear acute segments; inflorescence very much congested, almost head-like; involucre 1- to 2-leafed or none; bractlets of the involucels conspicuous, longer than the fruit, 2- to 5-toothed; rays few, 2 to 3 lines long; pedicels about 1 line long; fruit ovate, glabrous, flattened laterally, 3 mm. long; carpels flattened dorsally; ribs 5, small; oil-tubes 2 to 3 in the intervals; seed face with a broad, shallow concavity; calyx teeth prominent; stylopodium conical.

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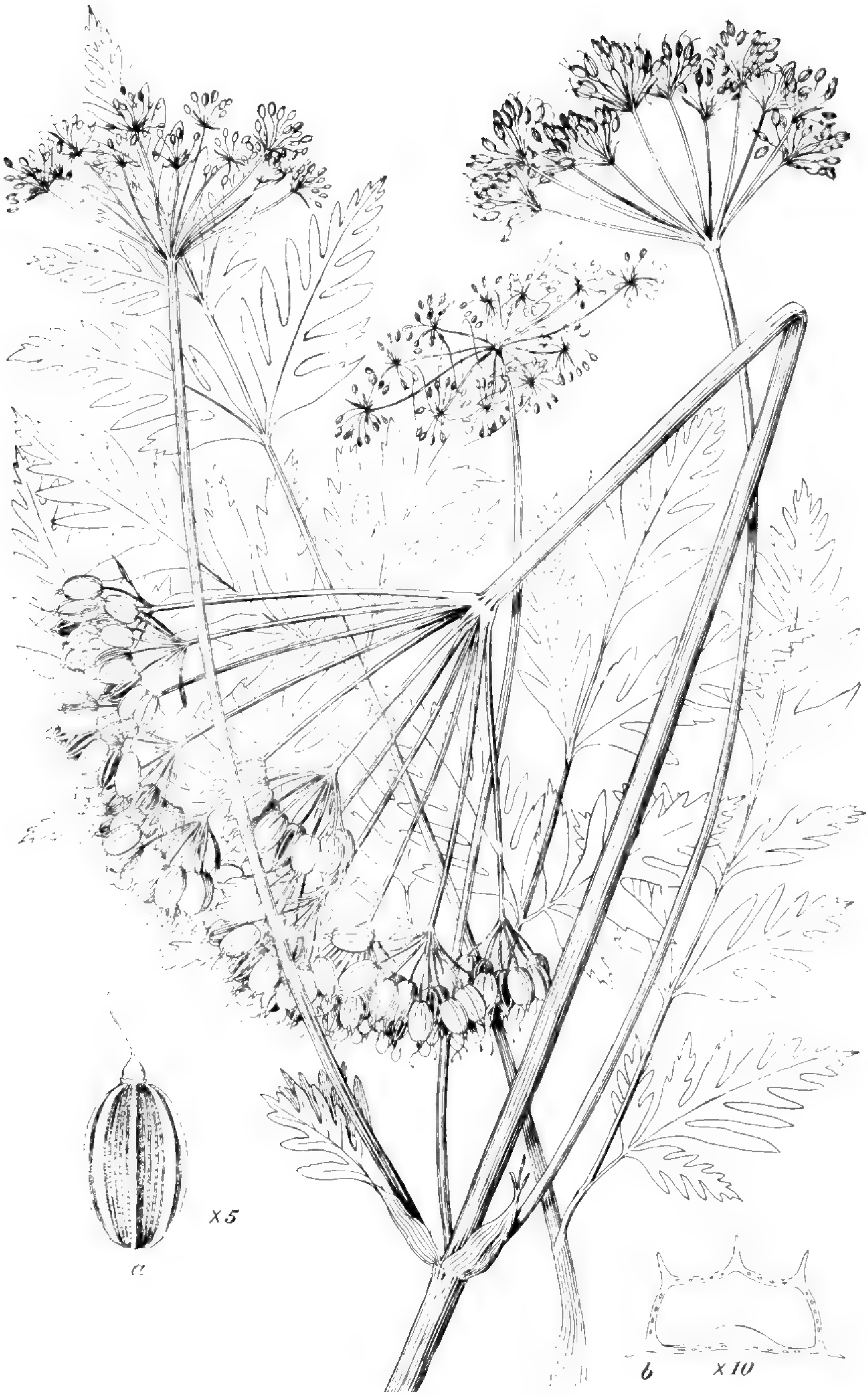
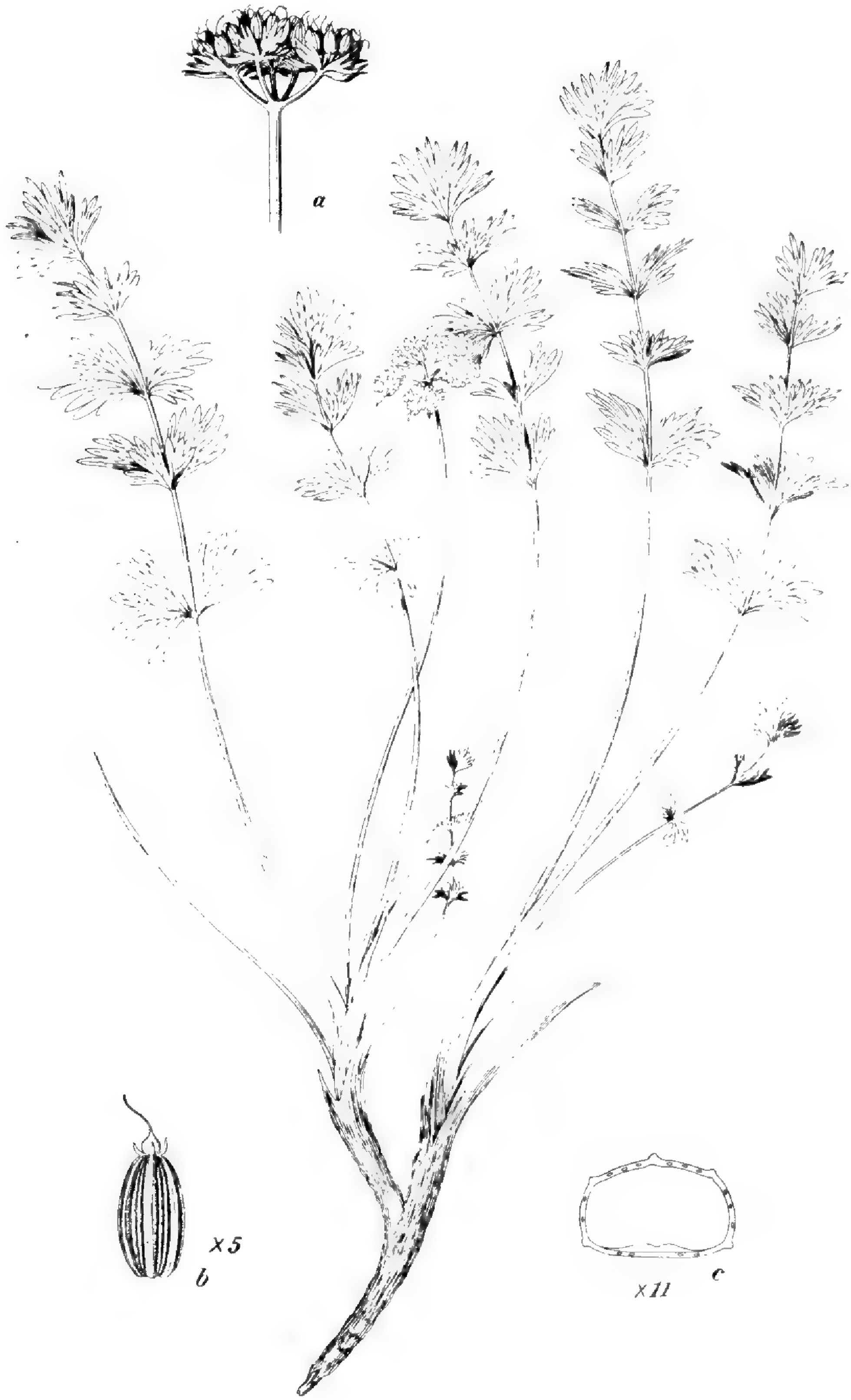
[1] Annales, i, 350. [2] Proc. Amer. Acad. xvii, 374.

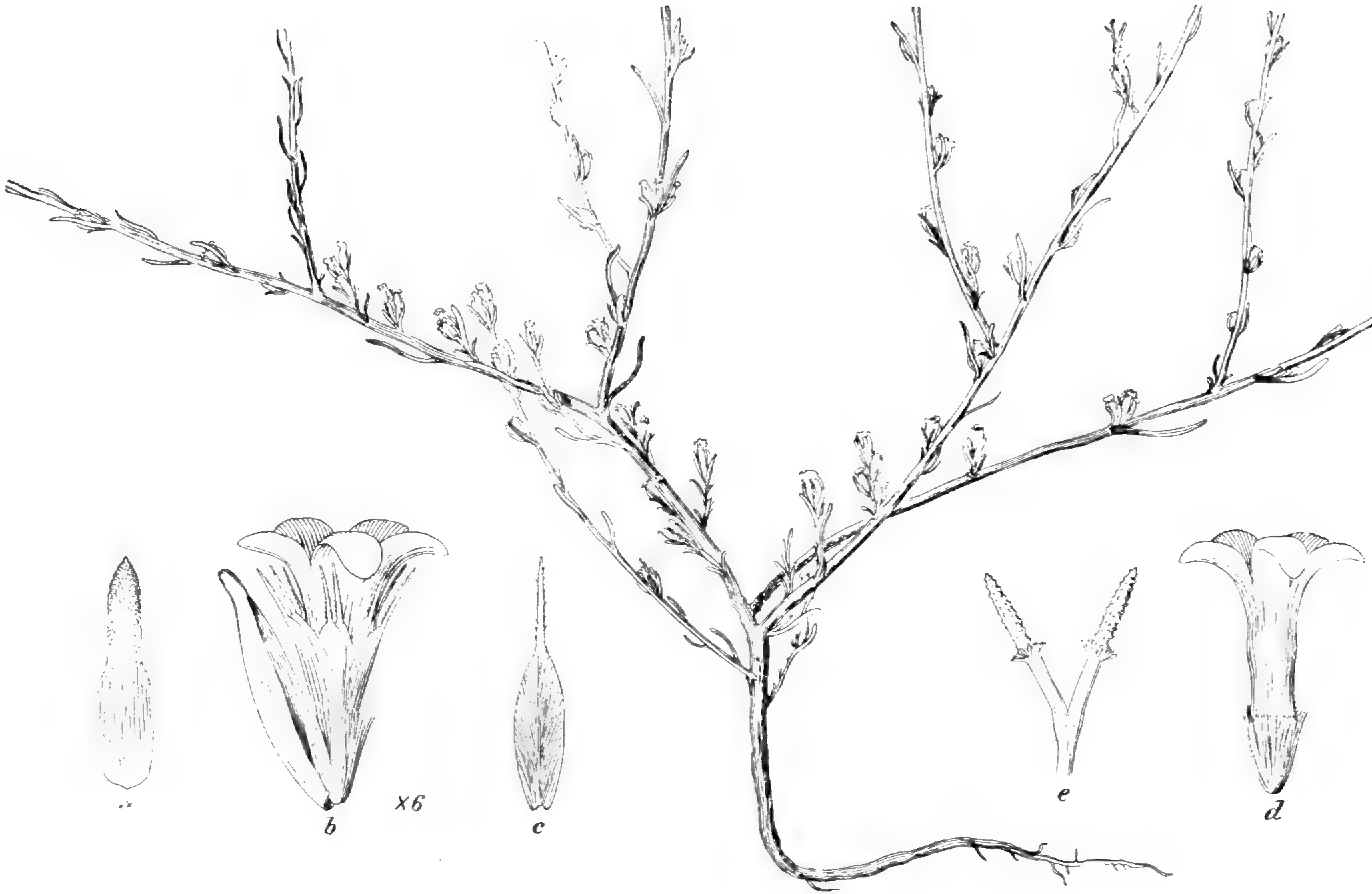


LIGUSTICUM VERTICILLATUM (Hook.) Coult. & Rose.



LIGUSTICUM EASTWOODÆ Coult. & Rose

VELÆA GLAUCA Coult. & Rose.



THUROVIA TRIFLORA Rose.

Cumberland Basin, La Plata Mountains, Colorado. In flower July 23, 1890 and 1891, and in fruit August, 1892.

Miss Eastwood sent this plant in for several years; the last time with good fruit, so that its position can be satisfactorily determined. It is with much pleasure that we can name a new species for this diligent collector. This species and *L. macounii* are very much alike in habit and quite different from all the other North American species.

EXPLANATION OF PLATE.—Fig. *a*, fruiting umbel, natural size; *b*, carpel, dorsal view, enlarged 5 diameters; *c*, cross section of the same, enlarged 11 diameters.

Velæa glauca Coult. & Rose, sp. nov. PLATE XIV.

Shortly caulescent, slender, 4.5 dm. or less high, erect or somewhat spreading, glabrous and somewhat glaucous; radical leaves small, bi- or tri-ternate; stem leaves often simply ternate; leaflets small, 12 mm. or less long, mostly cordate or truncate at base, often 3-lobed or 3-parted, irregularly toothed; umbel 7- to 15-rayed, with no involucre and involucels of small linear bracts; rays 2.5 to 5 cm. long; pedicels 2 mm. or less long; fruit orbicular, 2 mm. in diameter; carpophore parted below the middle; flowers yellow.

Oregon, Canyonville (Thomas J. Howell, April, 1881), Glendale (Thomas J. Howell, April 30, 1887), Woodville (Joseph Howell, May, 1888, and April 1, 1889).

After a study of the so-called glabrous forms of *V. kelloggii* in the light of more material and the notes kindly furnished by Mr. Joseph Howell, we feel convinced that this requires separation as a distinct species.

V. glauca differs from *V. kelloggii*, especially in its habit, glabrous stems and leaflets, and smaller fruit.

EXPLANATION OF PLATE.—Fig. *a*, fruiting umbel; *b*, carpel, side view, enlarged 5 diameters.

THUROVIA, A NEW GENUS OF COMPOSITÆ.

Thurovia Rose, gen. nov.

Heads discoid, few-flowered, sessile in the axils of the leaves: flowers hermaphrodite, fertile. Involucre small, oblong to oval; bracts in two series; the outer bracts about 5, linear, with conspicuous green tips; the inner bracts 3, somewhat inclosing the akenes, larger, with small green tips. Corolla regular, 5-toothed with broad funnel-form throat, proper tube short. Stamens entire at base: style branches short, comose-bearded, and with long slender appendages. Akenes small, turbinate, silky-pubescent, not nerved. Pappus of about 10 lanceolate, acuminate paleæ.—A low, spreading, much-branched glabrous annual. Leaves small, linear, alternate; involucre sessile mostly solitary in the axils of the leaves. Flowers white.

The relationships of this genus are obscure. In habit it most resembles the Asteroideæ. Mr. Thurow writes me that he collected it for a small-flowered Aster. Its habit, however, is more that of Gutierrezia or Greenella, especially of the latter genus. I have submitted a specimen to the well-known authority on this family, Dr. O. Hoffmann, of Berlin, but he points out that it has not the form of the style of this type. It is true, however, that Lessingia has somewhat similar style branches with the same peculiar wreath of brush-like hairs. Dr. Hoffmann suggests that its relationships are with the Helianthoideæ. He would place it in the neighborhood of Eriophyllum, but as distinct from the related genera in its few-flowered heads and habit.

This genus has been named for Mr. F. W. Thurow, a local collector of Hockley, Texas, who has already discovered several new species in this region.

Thurovia triflora Rose, sp. nov. PLATE XV.

Low, 20 to 45 cm. high, either bushy or straggling; leaves 6 to 18 mm. long; involucre 3 mm. long, 3-flowered; akenes 1 mm. long; paleæ 2 mm. long.

Common on the prairie northwest of Houston, Texas.

Collected October 25, 1892, by F. W. Thurow.

Mr. Thurow wrote me that he found the plant very common all along the country road from near Big Cypress Creek nearly to the city limits of Houston. Unfortunately only 4 specimens were obtained. Mr. Thurow, however, has promised to revisit the type locality and obtain a good supply of material so that our correspondents may be furnished with specimens of this peculiar genus.

EXPLANATION OF PLATE.—Fig. *a*, an outer involucral bract; *b*, flower with the subtending bract; *c*, paleæ of pappus; *d*, flower with pappus removed; *e*, style branches. Figs. *a*, *b*, *c*, and *d*, enlarged 6 diameters; *e*, much enlarged.

TRADESCANTIA BREVIFOLIA AND T. LEIANDRA.

Considerable confusion has existed with regard to *Tradescantia leiandra* and its varieties. In working over some of Mr. Heller's excellent specimens from Corpus Christi, Texas, with all the material of these forms from the Gray, Torrey, and National herbariums before me, I have been able to clear the subject up.

The species proper is very rare. It was collected by Bigelow on the first Mexican Boundary Survey, and is represented by a single sheet labeled in Dr. Torrey's handwriting, now deposited in the National Herbarium. The variety *brevifolia* was also collected on this survey, and was described by Dr. Torrey in his part of the report. The type specimen of this variety, also collected by Bigelow, is deposited in the Torrey herbarium at Columbia College, and there are no duplicates in the Gray or National herbariums.

The confusion has been caused partly by the wrong reference by Dr. Torrey of Wright's No. 700 (at least a part of it) to his *leiandra* rather than to the variety *brevifolia*. Wright's No. 700 is a medley composed of at least 3 species. One of these contained in the Gray herbarium and labeled *T. leiandra* is clearly Torrey's variety *brevifolia*, and is possibly the one referred to by Torrey. This form is not represented either in the Columbia College or National Herbarium. Then, too, it seems that none of the monographers of this genus have seen the true *leiandra*, owing to its rarity, and have confused the variety with it. The *brevifolia* is much the more common form, and extends from Corpus Christi to northern Mexico. I have not been able to find the species *leiandra* in either the Gray or Columbia College herbarium, and until recently it was only represented by the single specimen referred to above. I have found, however, in the herbarium of the National Museum in charge of Professor Ward, now a part of the National Herbarium, a single poor, but quite characteristic, specimen of this species. This was obtained by Dr. V. Havard, U. S. Army, at Copote Creek, Texas, in September, 1883 (No. 79).

Mr. C. B. Clark[1] first and very properly separated these two forms as distinct species, but unfortunately referred the *brevifolia* form to the genus Zebrina and as *Z. leiandra*. Dr. Sereno Watson[2] afterwards called attention to the fact that it is a good Tradescantia, but made the mistake of considering it the true *leiandra* and was followed by Mr. Hemsley.[3]

The variety clearly deserves specific rank, probably under Tradescantia, and should bear the name *T.* (?) *brevifolia*.

It differs from *T. leiandra* in its habit, in its broader and shorter leaves with the margin ciliate-scabrous and the sheath hairy instead of smooth, in its much larger and not acuminate floral leaves, and in its hairy filaments.

I have recently found that Buckley[4] had actually described this species in Proceedings of the Philadelphia Academy, although I do not find his description referred to in Mr. Clark's exhaustive monograph or in any other work. His name *speciosa* has been used at least twice before and may very well be passed over.

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[1] DC. Monogr. Phan. iii, 318.

[2] Proc. Amer. Acad. xviii, 167.

[3] Biol. Centr.-Amer. iii, 393.

[4] It is of interest to know that the type locality of Buckley's plant is Corpus Christi, Texas, where Mr. Heller obtained his material.

TRADESCANTIA BREVIFOLIA (Torr.) Rose.

Dr. Torrey, in his original description, states that the general appearance of the plant is certainly very unlike that of *T. leiandra,* but he hesitates to describe it as a distinct species.

T. leiandra variety *ovata* Coulter, described from insufficient material, belongs with the *brevifolia.*

T. brevifolia has been collected as follows: By Charles Wright, in western Texas in 1849 (No. 700), a part of the type of *T. leiandra;* by Dr. Havard, in the Chisos Mountains, western Texas, in 1883 (No. 78); by Dr. Palmer, at Soledad, Coahuila, Mexico, in 1880 (No. 2014); by G. C. Nealley, in the Chenata Mountains, Texas (Presidio County), in 1889 (No. 487), the type locality of variety *ovata;* by J. M. Bigelow, in mountains near the Pecos River, western Texas (No. 1500a), the type locality for this species; by A. A. Heller, near Corpus Christi,[1] Texas, in 1894 (No. 1427); also by Buckley, who distributed it as a new species and some of whose specimens are in the Durand herbarium, according to a note by Dr. Gray on one of his sheets.

The synonymy of this species is as follows:

Tradescantia leiandra brevifolia Torrey, Bot. Mex. Bound. Surv. 225 (1859); *T. speciosa* Buckley (not L. or H. B. K.), Proc. Acad. Phila. 1862, 9 (1863); *Zebrina* (?) *leiandra* Clark, in DC. Monogr. Phan. iii, 318 (1881); *T. leiandra,* Watson, Proc. Amer. Acad. xviii, 167 (1883); Hemsley, Biol. Centr.-Amer. iii, 393 (1885); *T. leiandra ovata* Coulter, Contr. Nat. Herb. i, 50 (1890); ii, 444 (1894).

Tradescantia (?) **brevifolia** (Torr.) Rose. PLATE XVI.

Stems at first erect, becoming prostrate, leafy to the top; leaves approximate, ovate, 1 to 3 inches long, 1 inch wide, thickish, glaucous and glabrous except the ciliate-scabrous margins, acute; margin of sheath ciliate; involucral leaves 2, like the lower leaves, but smaller; umbel sessile, many-flowered; corolla white; pedicels and calyx densely villose; filaments hairy, attached to the corolla; ovary hairy at top.

EXPLANATION OF PLATE.—Fig. *a,* branch of *T. brevifolia; b,* leaf, and *c,* involucre of *T. leiandra.* Figs. *a, b,* and *c,* natural size.

Tradescantia leiandra Torr. Bot. Mex. Bound. Surv. 224 (1859).

Roots slender, fibrous-thickened; stems erect, somewhat branching, slender, glabrous, somewhat naked above; leaves distinct, narrowly lanceolate, 3 to 5 (perhaps more) inches long, 6 lines wide, sharply acute, with margins not scabrous; margin of sheath glabrous or nearly so; involucral leaves 2, ovate, acuminate, 1 to 1.5 inches long, very unlike the lower leaves; umbel sessile, many-flowered; pedicels and sepals densely villose; filament smooth; capsule oval, somewhat 3-lobed, stipitate; cells 3 2-seeded; seeds 0.5 line in diameter, slightly rugose.

Collected by Bigelow in mountains and moist rocky places at Puerto de Paysano, Texas, September 18, 1854 ? (No. 1500), and by V. Havard at Copote Creek, Texas, September, 1883 (No. 79).

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[1] Living specimens have recently been sent to me by Mr. G. C. Nealley, from this place, which I now have growing in one of the greenhouses of the Department of Agriculture.

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U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF BOTANY.

CONTRIBUTIONS

FROM

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BOTANY OF YAKUTAT BAY, ALASKA.

By FREDERICK VERNON COVILLE.

WITH A FIELD REPORT

By FREDERICK FUNSTON.

WASHINGTON:

GOVERNMENT PRINTING OFFICE.

1895.

LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF BOTANY,
Washington, D. C., August 21, 1895.

SIR: I have the honor to transmit herewith, for publication as Volume III, No. 6, of Contributions from the United States National Herbarium, a manuscript entitled "Botany of Yakutat Bay, Alaska." This paper constitutes a report on the botany of one of the obscure parts of our country, and is a result of the explorations of a field agent of this Department, Mr. Frederick Funston, during the summer of 1892.

Respectfully,

FREDERICK V. COVILLE,
Botanist.

HON. J. STERLING MORTON,
Secretary of Agriculture.

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BOTANY OF YAKUTAT BAY, ALASKA.

1.—FIELD REPORT.

By Frederick Funston.

In accordance with my commission and letter of instructions to proceed to Yakutat Bay, Alaska, and make a collection of the plants of that vicinity, I took passage from San Francisco on the Coast Survey steamer *Hassler*, having purchased a camp outfit and hired a laborer to accompany me on the trip as cook and general camp employee. The *Hassler* sailed April 16, 1892, and on her way north touched at Port Townsend, Victoria, Departure Bay, Port Simpson, and Sitka, arriving at Yakutat Bay May 19, after a voyage of thirty-three days. On the night following our arrival there arose a heavy southeasterly wind, accompanied by rain, which continued with great violence for five days; so that it was not until May 25 that I was able to establish my camp on shore. In order to have some place suitable for storing supplies and caring for specimens, I rented from the natives a house situated in the smaller of their two villages, on Khantaak Island; the larger village being on the mainland, distant about a mile.

The Indians, of whom about two hundred live in the vicinity of Yakutat Bay, belong to the Thlinket tribe and are uncivilized, though apparently well disposed toward white people who come among them. They live in rude houses of their own construction, and subsist mostly on fish, both fresh and smoked, shellfish, crabs, and other marine animals, besides the flesh and oil of the hair seal. Seal oil seems to be their staff of life, as it is eaten with nearly all kinds of food, both animal and vegetable. During the summer season the Indians use large quantities of berries, and also utilize several edible plants, to be mentioned hereafter.

Immediately on establishing my camp I began the work of collecting, though at this season but few plants were in flower. I endeavored to obtain twenty sheets of dried specimens of each species, but in some cases only a partial series could be secured on account of the scarcity of the plant. The drying papers were changed two or three times every day and dried by hand over a fire before they were returned to the presses, this work being rendered necessary by the great humidity of the atmosphere and the almost daily rains. During the season about 10 cords of wood were used in keeping up these fires.

Yakutat Bay and the land in its immediate vicinity may be briefly described as follows: The bay, which lies approximately in latitude 60° N. and longitude 140° W., not only extends through the narrow strip of lowland separating the St. Elias range of mountains from the ocean, but also penetrates the range itself for a considerable distance. Its width at the entrance, between Ocean Cape on the east and Point Manby on the west, is about 20 miles, and its length, from the capes to the entrance of Disenchantment Bay, about 30 miles. The latter bay is merely an extension of Yakutat Bay, and lies wholly within the St. Elias range, being walled in by tremendous mountains rising from the water's edge. Its length is about 25 miles, and its width from 3 to 5 miles. Great glaciers composed of pure ice several hundred feet in thickness extend down to the water and throw off large numbers of icebergs, which crowd the waters of the bay at all times and are carried by the tides into Yakutat Bay, lining its western shore as far as Point Manby, the prevailing southeasterly winds holding them against this shore. The largest of the glaciers on Disenchantment Bay are the Hubbard and Dalton, the former having a frontage on the water of 6 miles and the latter of 2 miles, and each being about 15 miles long.

Beginning again at the entrance of Yakutat Bay, and following its eastern shore line from Ocean Cape to the foothills of the St. Elias range, a distance of about 20 miles, the surface of the country is generally level, though in some places there are hills 50 feet high. About 2 miles from Ocean Cape the Ankow River, a sluggish stream a hundred yards wide, empties into the bay. The Ankow has not been explored, but the Indians give its length as about 20 miles. As the country through which it flows has but little elevation above the sea, the waters of this river are extremely brackish as far as 7 miles from its mouth, being affected by the sea water at high tide. Between the mouth of the Ankow and the foothills of the mountains a number of small freshwater streams reach the waters of the bay. After the foothills of the range are reached the entire surface of the country undergoes a radical change, becoming extremely broken and mountainous, with numerous very rapid streams. In this region there is very little level land, the mountains generally rising from the beach to far above the line of perpetual snow. The most conspicuous peak in this locality is Mount Tebenkof, elevation unknown. Proceeding farther north, up the bay, the mountains become more precipitous and the snow line gradually comes nearer to sea level, until at the entrance to Disenchantment Bay the country has a decidely Arctic character. It is on this latter bay that the great glaciers appear, and in some sheltered canyons snow is found at sea level even in midsummer. Crossing the upper end of Yakutat Bay to the west side, near the mouth of Dalton Creek, the country is generally level, sloping gradually upward toward the mountains. In this vicinity a number of wide gravel washes, cut up by numerous small streams, come down from the neighboring mountains.

From the mouth of Dalton Creek to Point Manby, a distance of 30 miles, the narrow strip of land, less than a mile wide, lying between the beach and the edge of the Malaspina Glacier, is a succession of sand dunes near the beach and of gravel ridges near the glacier, with here and there small streams formed by the melting of the glacier ice.

On the eastern side of Yakutat Bay are about a dozen small islands, ranging in size from Khantaak, 7 miles long, to some less than an acre in extent.

During the first three weeks following my arrival, I collected on Khantaak Island and on the adjacent mainland from the Mission to Ocean Cape, and also took a canoe trip to Mr. McGrath's[1] camp, on the opposite side of the bay near Point Manby, a distance of 20 miles, but found little here that I had not already collected. Several days of the latter part of June were spent on a trip by sea to the base of Mount Tebenkof, a distance of 18 miles, but the weather was such that little was accomplished. A canoe trip to the mainland near Knight Island about the middle of July was more successful, though I was compelled by a heavy rain storm to return after a stay of one day. Several other journeys were made by canoe during the summer whenever the weather would permit, and nearly every accessible point on the shores of the bay was visited. It had been my original intention to spend the greater part of the summer at Dalton's cabin, an abandoned house in the forest, 3 miles from the beach on the west side of the bay near its head; but a dense ice pack which lay off this shore nearly all the summer precluded any attempt to effect a landing.

On August 2, accompanied by my laborer and another man employed to assist in handling the canoes in the ice, I left Khantaak Island with two canoes containing my camp outfit, collecting apparatus, and provisions for a two weeks' cruise, visiting nearly every part of Disenchantment Bay and climbing many of the mountains on its shores to the line of perpetual snow. The greater part of my collections in this region were made on the southern shore of the bay, near the large rock known as Haenke Island. Canoeing in Disenchantment Bay was attended with much labor and no little peril, as we were constantly in danger of being crushed in the floating ice which filled the bay at nearly all times.

On August 14, while camped on the east side of Disenchantment Bay near its entrance, I noticed that the ice floe off the mouth of Dalton Creek seemed to be less densely packed than usual, and, loading both canoes, I crossed to the opposite side and succeeded in landing, though one of the canoes was upset in the surf. Two days later I returned to Khantaak Island with my entire outfit. During this two weeks' trip the weather was exceptionally favorable and the collections were the most satisfactory made during the season. The rain poured in torrents nearly every day during the latter half of August, though some collecting was done in the intervals. The rainfall is said to have been

[1] Of the United States Coast and Geodetic Survey.

heavier in the summer of 1892 than in any other since the American occupation of Alaska. From my arrival at Yakutat Bay on May 19 until my departure on September 4, a period of 107 days, there were but 24 days wholly without rain.

The plant life of the region about Yakutat Bay is characterized by the dense and vigorous growth of a comparatively small number of species, giving the forests especially an appearance of great sameness.

The almost level country lying on the eastern side of the bay, between Ocean Cape and the foothills of the mountains, is covered with a forest growth practically impenetrable. The great amount of fallen timber, together with the tangled and heavy undergrowth, constitute such obstacles to travel that even the Indians, who have lived here many years, have never penetrated the forests of the mainland for a mile from their own village. The great bulk of this forest is composed of the Sitka spruce (*Picea sitchensis*), which in this region reaches a height of 70 feet. This tree extends from sea level to an altitude of 2,200 feet on the sides of Mount Tebenkof; but as one follows the coast line up the bay from this mountain, the upper limit becomes lower and lower, until at the entrance of Disenchantment Bay it reaches sea level, the tree not being found on the shores of this bay. A large forest lies along Dalton Creek, and there are several of considerable extent between this place and Point Manby.

The timber of the spruce tree plays a most important part in the economy of the natives, as from it are constructed their houses and canoes, and it is used in the manufacture of oil crates, bows, arrows, and other implements, while the smaller roots, after being boiled and split, are used in basket weaving.

The hemlock (*Tsuga mertensiana*) is found scattered through the spruce forests, and seems to have about the same vertical range as that tree, but is much less abundant and is somewhat smaller in size. The only other conifer found in this vicinity was a single individual of Sitka cypress (*Chamæcyparis nootkatensis*), a small tree on Khantaak Island near the Indian village.

The red alder (*Alnus rubra*) is found in great quantities throughout the forest region, especially on the edges of open glades, along the banks of streams, near the beach, and on the mountain sides, above the limit of spruce. On the western slope of Mount Tebenkof it reaches an altitude of 3,000 feet, 800 feet higher than spruce and hemlock, and grows on these higher slopes in such dense jungles as to be almost impenetrable, constituting one of the most serious obstacles to mountain climbing in this region. On the shores of Disenchantment Bay, where the spruce is not found, the alder reaches an altitude of 800 feet. This tree is also found in large quantities along the western shore of the bay.

A willow (*Salix barclayi*), growing from 5 to 10 feet high, is found sparingly on Khantaak Island and in the low forest region, and is abundant in the wide canyons and washes of the St. Elias range and

along the numerous small streams flowing from the Malaspina glacier, where it forms dense thickets which are the favorite resort of the ptarmigan.

The elder (*Sambucus racemosa*), an erect shrub about 8 feet in height, is common but not abundant in the open, well-drained tracts near the margin of the forest, more especially on Khantaak Island and near the mouth of the Ankow River. The bright, red berry ripens about the 1st of September, but as I left the country about this time I can not say whether the natives use this fruit or not.

Menziesia ferruginea, an erect shrub from 4 to 6 feet high, which flowers during the first half of June, is scattered through the denser forests. The highest altitude at which this plant was found was 1,800 feet above the sea on the sides of Mount Tebenkof, where, on June 22, the buds were not yet open.

The high-bush cranberry (*Viburnum pauciflorum*) is common in the forest region, growing more abundantly along the margins of the glades than in the dense woods. The blossoms are open in early June. The fruit—a bright scarlet berry about the size of a pea—is ripe after August 20 and is highly prized by the natives, who use large quantities in season but do not preserve it for winter consumption.

The blueberry (*Vaccinium ovalifolium*), a shrub 4 feet in height, forms a large part of the forest undergrowth in the low country, but is not found at any considerable altitude. The fruit, a dark purple berry larger than a pea, is collected in great quantities by the natives, who not only use it in season but preserve it for winter, drying the crushed berries by artificial heat. It is considered an important article of food, and in September, immediately after the close of the fishing season, nearly all the women and children of the village begin collecting and drying a supply for the coming winter.

Rubus spectabilis, known all along the northwest coast as the salmon berry, a spreading bush from 4 to 6 feet in height, grows in immense quantities in the less densely shaded forests and along the beach. It reaches an altitude of 2,200 feet on Mount Tebenkof. At this place, however, the growth is much stunted, as it is also on the sides of a mountain above the entrance of Disenchantment Bay at an altitude of 1,100 feet. The fruit, which in general shape resembles the red raspberry, is about an inch long by half an inch in diameter, and varies in color from very light to very dark red. It begins to ripen at sea level about August 5, and at higher altitudes two weeks later. During the season it is an important article of food among the natives, who gather large quantities in baskets. The berry is sometimes eaten as taken from the bush, but is usually crushed in a wooden bowl and eaten with seal oil. It is not preserved for winter use.

The devil's club (*Echinopanax horridum*), an erect shrub from 4 to 6 feet in height, with slender woody stem branching near the top, and densely covered with short, sharp prickles, is abundant in all the forests

of this vicinity, and on the mountain sides reaches an altitude of 1,800 feet. The dense and tangled growth of this plant, together with the fact that the points of the prickles break off immediately on penetrating the skin, make it an almost intolerable nuisance to one attempting to travel through the forest. It is found wherever the ground is shaded by forest growth, but does not thrive on the open, treeless sand beaches. Its large clusters of white, sweet-scented flowers are open in May and June, and the fruit, a red, nonedible berry, ripens about the last of August.

The black currant (*Ribes laxiflorum*), a thorny spreading bush 5 feet high, is abundant in the more densely shaded forests, especially on the slopes of the foothills, where it reaches an altitude of 1,900 feet, and in some places forms considerable thickets. A few stunted specimens were found at sea level on Disenchantment Bay. The berry, which is dark purple, almost black, ripens about August 10, and is not eaten.

Of the smaller plants found in the forest region, the most conspicuous, perhaps, not only on account of its showy white blossoms, but because of its great abundance, is *Cornus canadensis*, growing among mosses and on decaying tree trunks. The star-flower (*Trientalis europæa arctica*) is found on decaying logs in the forest, as is also *Coptis trifolia*. Other small plants found here and there in the forest region are *Tiarella trifoliata*, *Moneses uniflora*, *Pyrola secunda*, *Streptopus amplexifolius*, and *Lycopodium annotinum*. On the banks of small streams are found *Saxifraga punctata*, *S. stellaris*, *S. mertensiana*, *Mimulus langsdorfii*, *Heuchera glabra*, and *Claytonia sibirica*. The last-named plant is eaten both raw and cooked by the Indians. Of ferns, *Polypodium vulgare* is abundant in the low forest region, growing about the bases of tree trunks. *Dryopteris spinulosa*, which reaches a height of from 1 to 5 feet, grows in immense quantities in the damp woods, and was found at an altitude of 2,000 feet on the sides of Mount Tebenkof. *Phegopteris dryopteris* is also very abundant, and reaches an altitude of 1,100 feet on the mountain sides. During the season one specimen of *Dryopteris lonchitis* was found in the forest near Dalton Creek.

Scattered through the forests of the Yakutat Bay region are a number of small, open, treeless spots varying from a few square rods to an acre or two in extent. The larger of these glades are generally swampy, and in some of them water is standing all summer, while others are well drained, and there is no apparent reason for the lack of forest growth. These glades are few in number, and occupy in the aggregate an extremely small percentage of the total forest area. Owing to the fact that the sunlight has free access to them, these spots have a much heavier growth of the smaller plants than has the densely shaded forest. All these opens that are not too swampy have a heavy growth of grass, chiefly *Deschampsia cæspitosa*, though a few specimens of *Savastana odorata* were found in some of them as well as on the tops of sunny bluffs. *Fritillaria kamschatcensis* is found not only in the opens of the

lower forest, but at an altitude of 3,000 feet on Mount Tebenkof, where however the specimens were very much stunted. The flower is of a dark brown color, and has an extremely offensive odor. The bulbs are dried and eaten by the natives, but are not considered a staple article of food.

Heracleum lanatum, a plant from 3 to 5 feet in height, and of very rapid and vigorous growth, is common in the open places of the forest, and is also found at sea level on Disenchantment Bay. The leafstalks of this plant, which are about 2 feet long, are peeled and eaten raw by the natives, after the manner of celery.

Rubus pedatus, a plant not more than 4 inches in height, is common in many of the opens. Its small red berry has an excellent flavor and is eaten by the natives.

Among the other plants found in these glades are *Caltha palustris*, *Rubus stellatus*, *Viola langsdorfii*, *Actæa spicata arguta*, *Geum macrophyllum*, *Carex limosa stygia*, *Cœlopleurum gmelini*, *Erigeron salsuginosus*, *Tofieldia glutinosa*, *Iris setosa*, *Epilobium luteum*, *Polygonum viviparum*, *Ligusticum scothicum*, *Cicuta virosa*, *Aster foliaceus*, *Lathyrus palustris*, *Arnica latifolia*, *Epilobium palustre* (very rare), *Ranunculus reptans*, *Potentilla palustris*, *Habenaria dilatata*, *H. hyperborea*, *Eleocharis watsoni*, *Juncus falcatus alaskensis*, and *Equisetum variegatum*. *Menyanthes trifoliata* and *Nymphæa polysepala* grow in the shallow ponds that are found in some of these opens.

Stretching along the beach from Cape Phipps to the Ankow is a treeless strip of low sand dunes lying between high-tide mark and the margin of the forest, a distance of 100 yards. The area of this tract is about 10 acres. At the southeastern extremity of Khantaak Island is an equal area of the same nature, while the greater part of the land on the western side of the bay is of the same treeless, sandy character. The vegetation of these sand dunes is less dense and rank than that of the forest opens, though in some localities many acres are covered with a heavy growth of the strawberry (*Fragaria chiloensis*). On the grassy sand dunes that extend from the mouth of Dalton Creek to Point Manby and lie between the beach and the margin of the Malaspina glacier, this plant is found in immense quantities. On Khantaak Island and at Cape Phipps the fruit begins to ripen about July 1, and on the west side of the bay two weeks later. Strawberries were abundant at Dalton Creek as late as August 15. The fruit is about one-half inch long, somewhat pear-shaped, and of a light pink color. The berries have an excellent flavor, and are eaten in large quantities by the natives, who first cover them with seal oil, as they do all fruit. They are not preserved for winter use.

The coarse grass found along these sandy beaches is *Elymus arenarius*. The stems of this grass are cut while green by the Indians and dried over a fire, after which they are used in the manufacture of baskets, being woven into ornamental figures among the split spruce-roots of which the basket is made.

The other plants found on these sandy stretches are *Lathyrus maritimus*, which is very abundant; *Arabis hirsuta*, sometimes eaten raw by the Indians; *Arenaria lateriflora*, *Castilleja miniata*, *Ranunculus nelsoni*, *Lupinus nootkatensis unalaskensis*, *Epilobium latifolium*, *Pneumaria maritima*, *Phellopterus littoralis*, *Rhinanthus crista-galli*, *Achillea millefolium*, *Gentiana amarella*, *Selinum gmelini*, *Pedicularis palustris wlassowiana*, and *Juncoides campestre sudeticum*.

Along the gravel beaches just out of reach of high tide are found *Glaux maritima*, *Arenaria peploides*, *Puccinellia maritima*, and *Poa glumaris*.

The mountains of the St. Elias range in the Disenchantment Bay region, as has already been stated, are clothed to an altitude of about 800 feet with a dense growth of *Alnus rubra*. There are, however, in some localities extensive breaks in these thickets which are well filled with other vegetation, while there is a considerable variety of growth above the limit of this tree. A few of the plants in the vicinity of Disenchantment Bay have already been mentioned as occurring on Khantaak Island and on the mainland near the Mission, but the great majority of those collected in this region were not found in the low forest country. Beginning at about the upper limit of the red alder, the mountain sides are covered with a heavy growth of grass, *Deschampsia caespitosa longiflora*, to an altitude of 2,550 feet. These grassy slopes are in many places given a decidedly bluish tinge by the blossoms of the monkshood (*Aconitum delphinifolium*). Above the grass limit the vegetation is more scattering, and consists mostly of *Salix arctica*, a willow about 3 inches in height; *Saxifraga bronchialis*, *Geranium erianthum*, *Cassiope stelleriana*, *Luetkea pectinata*, and *Bryanthus glanduliflorus*. The highest altitude which I reached on these mountains was 4,250 feet above the sea. At this height, at the time of my visit (the first two weeks of August), one reaches almost continuous snow fields, the mountains being unbroken white except where they are too steep for the snow to lie on, or where it has been swept away in an avalanche.

Among the plants collected in this treeless mountain region, besides those already mentioned, were *Tellima grandiflora*, *Arabis lyrata*, which is eaten raw by the natives; *Cerastium alpinum*, *Pyrola minor*, *Valeriana sitchensis*, *Potentilla procumbens*, *Parnassia fimbriata*, *Artemisia norvegica*, *Potentilla villosa*, *Barbarea barbarea*, *Ranunculus cooleyæ* (very rare), *Antennaria alpina*, *Campanula rotundifolia alaskana*, *Tussilago frigida*, *Antennaria margaritacea*, *Hieracium triste*, *Habenaria bracteata*, *Lycopodium alpinum*, *Anemone narcissiflora*, *Prenanthes alata*, *Aquilegia formosa*, *Arnica latifolia*, *Romanzoffia sitchensis*, *Euphrasia officinalis*, *Geum calthifolium*, *Cryptogramme acrostichoides*, *Cystopteris fragilis*, *Agrostis exarata*, *Phleum alpinum*, and *Poa alpina*.

As has been stated at the beginning of my report, but little collecting was done after my return to Khantaak Island from Disenchantment

Bay, on account of the weather, so that my work for the season was now practically closed.

The total number of specimens collected during the summer was about 3,000, representing 154 different species.

The work of the coast survey parties having been completed, the *Hassler* called in at Yakutat on September 3, and the next day started on her return to San Francisco. On account of a delay at Sitka and continued unfavorable weather, the vessel did not reach Port Townsend until October 3, 1892. As the time of the ship's departure for San Francisco from this port was uncertain, I left the vessel here and proceeded east.

In closing, I wish to acknowledge my indebtedness to Captain Harber and other officers of the *Hassler*, and to Messrs. McGrath and Turner, of the United States Coast and Geodetic Survey, all of whom took a lively interest in my work and aided me in many ways.

II.—BOTANICAL REPORT.

By FREDERICK VERNON COVILLE.

INTRODUCTORY NOTE.

The excellent collection of plants brought by Mr. Funston from the vicinity of Yakutat Bay, Alaska, in 1892, gives us our first comprehensive knowledge of the flora of that locality. The specimens collected undoubtedly represent nearly all the species of vascular plants that occur in the area traversed, but circumstances prevented, for the most part, the collection of the cellular cryptogams.

Yakutat Bay is an interesting point in the classification of the zonal plant areas of the Pacific Coast, for at this place the dense coastal forest characteristic of the coast mountains of British Columbia and southern Alaska is broken by the occurrence of a series of glaciers which here come down to the very beach, counteracting the influence of the warm ocean currents and driving the timber line backward into the sea. Westward from Yakutat Bay such breaks are frequent as far as Cooks Inlet and the eastern part of Kadiak Island.[1] West of these points the coniferous timber of the coast region ceases.[2]

On the west side of Yakutat Bay the Malaspina Glacier prevents the growth of trees except at a few sheltered points. The forest on the east side of Yakutat Bay, from Ocean Cape to Mount Tebenkof, a distance of about 30 kilometers, is described by Mr. Funston as dense and impenetrable and extending inland for an unknown distance. Of such a nature is the coastal forest which extends almost uninterruptedly to Sitka and still farther south.

The transition ground of such a change from forest to perpetual snow and ice is full of interest. One stretch of it lies on the eastern shore of Yakutat Bay, from Mount Tebenkof to the point which marks the entrance of Disenchantment Bay, on the east. Following up the eastern shore of Yakutat Bay over the lowlands, the forest meets Mount Tebenkof, the southernmost peak of this section of the St. Elias range, and ascends it to an altitude, on its western slope, of 2,200 feet. From this point the timber line dips abruptly downward along the coastward

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[1] "The eastern part of Kadiak Island and those lying to the northeast of it are abundantly supplied with spruce and other trees." Contributions to the Natural History of Alaska, 1886, p. 16; by L. M. Turner. Arctic Series of Publications, No. II, Signal Service, U. S. Army.

[2] See map in Alaska Coast Pilot, 1879, Appendix I, Meteorology and Bibliography; by W. H. Dall.

slope of the mountains until at the mouth of Disenchantment Bay, about 20 kilometers from Mount Tebenkof, it meets the sea.

The conditions which favor the northward progress of the forest are: The low elevation of the coast region, the warmth of the ocean currents, and the prevailing southeasterly winds; while the opposing conditions are: The higher elevation of the mountains, the snow and ice which cover them, and the occasional northerly winds.

Two zones are clearly represented in the flora of the Yakutat Bay region, one extending from the sea up to timber line, the other from timber line to the lower limit of perpetual snow. The conspicuous floral features of these zones are described by Mr. Funston in his field report. In its general geographic relationship the Yakutat Bay flora shows an almost exclusively circumpolar origin, while in its differentiation from the circumpolar flora it conforms with that of Western British America and the mountains of Washington and Oregon.

The appended catalogue of the collection contains 137 species and varieties of vascular plants and 27 of cellular plants. The determination of the specimens in certain cases has been made by students of special groups, the name of each of whom is inserted in the proper place in the catalogue.

CATALOGUE OF SPECIES.

RANUNCULACEÆ.

Anemone narcissiflora L. Sp. Pl. i, 542 (1753). Type localities, the Alps of Austria, Switzerland, and Siberia. The specific name, apparently by a slip of the pen, was printed first "*narcissifolia*," but was corrected in a subsequent edition to *narcissiflora*.

Disenchantment Bay, August 13 (No. 114), nearly past flowering. The plant is abundant, ranging from 300 to 900 meters altitude.

Ranunculus cooleyæ Vasey & Rose, Contr. Nat. Herb. i, 289 (1893). The type specimens are those collected by Miss Cooley near Juneau, Alaska, and those of the present collection.

On the summit of a mountain on the mainland southeast of Haenke Island, Disenchantment Bay, August 10 (No. 99), at an altitude of 1,000 meters. Only four plants were seen. I am wholly unable to agree with Professor E. L. Greene[1] in considering this plant a close relative of *Kumlienia hystricula* (Gray) Greene, which is the *Ranunculus hystriculus* of Gray. In that peculiar plant the sepals are petaloid, being large and white like those of an Anemone, while the petals are reduced to minute stalked nectaries. In *Ranunculus cooleyæ* the sepals are of an herbaceous green color, while the petals have the large size, expanded form, and bright yellow color of an ordinary buttercup.

Ranunculus reptans L. Sp. Pl. i, 549 (1753); *R. flammula reptans* Meyer, Pl. Labr. 96 (1830). Described from specimens collected in Sweden and Russia.

Khantaak Island, July 31 (No. 81), along the margin of a fresh-water marsh.

Ranunculus nelsonii (DC.), Gray, Proc. Amer. Acad. viii, 374 (1873); *R. recurvatus nelsonii* DC. Syst. i, 290 (1818). The type specimens were collected on the island of Unalaska by David Nelson.

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[1] Erythea, ii, 193 (1894) and i, 53 (1895).

Knight Island, June 18 (No. 29), on a treeless, sandy bluff. It was common on Khantaak Island, and a few specimens were found on Mount Tebenkof at an altitude of 180 meters.

Caltha palustris L. Sp. Pl. i, 558 (1753). Type specimens from Europe.

On the east side of Yakutat Bay, near Ocean Cape, May 28 (No. 4); in the margins of fresh-water lagoons, but not abundant.

Coptis trifolia (L.) Salisb. Trans. Linn. Soc. viii, 305 (1807); *Helleborus trifolia* L. Sp. Pl. i, 558 (1753). Type localities, Canada and Siberia.

Khantaak Island, June 3 (No. 11); found sparingly among mosses and ferns in the lowlands.

Aquilegia formosa Fisch.; DC. Prodr. i, 50 (1753). Type locality, Kamchatka.

Disenchantment Bay, August 14 (No. 121); abundant up to an altitude of 200 meters.

Aconitum delphinifolium DC. Syst. i, 380 (1818). The type specimen was collected "in Hedge Island ad oras occidentales Americæ borealis" by David Nelson.

Disenchantment Bay, August 13 (No. 116); abundant on the grassy slopes of the mountains from 275 to 750 meters altitude.

Actæa spicata arguta (Nutt.) Torr. Pac. R. Rep. iv, 63 (1857); *A. arguta* Nutt.; Torr. & Gr. Fl. i, 35 (1838). The type locality is "woods of the Oregon [i. e., the Columbia] and its tributary streams."

Near the Mission, June 6 (No. 14); growing in treeless, sandy soil covered with grass.

NYMPHÆACEÆ.

Nymphæa polysepala (Engelm.) Greene, Bull. Torr. Club, xv, 84 (1888); *Nuphar polysepalum* Engelm, Trans. St. Louis Acad. ii, 282 (1865). Type locality, the higher Rocky Mountains, from the sources of the Platte to those of the Columbia. The various stations known at that time were also given.

Khantaak Island, June 26 (No. 43), in a fresh-water pond about 1 meter deep.

BRASSICACEÆ.

Barbarea barbarea (L.) MacMillan Met. Minn. Val. 259 (1892); *Erysimum barbarea* L. Sp. Pl. ii, 660 (1753); *Barbarea vulgaris* R. Br. in Ait. Hort. Kew. ed. 2, iv, 109 (1812). Type specimens from Europe.

Disenchantment Bay, August 8 (No. 95); growing in damp, shady spots from sea level to an altitude of 125 meters.

Arabis hirsuta (L.) Scop. Fl. Carn. ed. 2, ii, 30 (1772); *Turritis hirsuta* L. Sp. Pl. ii, 666 (1753). Original specimens, from Sweden, Germany, and England.

Khantaak Island, June 7 (No. 15); found abundantly about an old Indian camp. For use, see page 332.

Arabis lyrata L. Sp. Pl. ii, 665 (1753). Type specimen collected in Canada by Kalm.

Disenchantment Bay, August 3 (No. 84); common on rock slides and all places where other vegetation is scarce, at an altitude of 150 meters or less.

Cardamine oligosperma Nutt.; Torr. & Gr. Fl. i, 85 (1838). Type locality, "shady woods of the Oregon."

Khantaak Island, May 30 (No. 7); growing along the beach above tide water. Dr. N. L. Britton, to whom specimens have been submitted, refers them to *C. oligosperma*, yet doubtfully, for they have no mature fruit. He says that they are certainly not *C. hirsuta*.

Draba stenoloba Ledeb. Fl. Ross. i, 154 (1842). The type specimens were collected on the island of Unalaska by Chamisso and Eschscholtz.

Disenchantment Bay, August 9 (No. 96); on the sides of a rocky cliff, 90 meters above the sea. These specimens are in some cases annuals, in others biennials or

short-lived perennials, but they retain in the latter case a characteristic slenderness of the persistent part of the stem. Such specimens seldom occur in the Rocky Mountains and Sierra Nevada, but, according to Ledebour, a subperennial habit is characteristic of the species.

VIOLACEÆ.

Viola glabella Nutt.; Torr. & Gr. Fl. i, 142 (1838). Type locality, "shady woods of the Oregon," i. e., the Columbia River.

Near the entrance of Disenchantment Bay, July 24 (No. 74), on a mountain slope at the altitude of 125 meters.

Viola langsdorfii Fisch.; DC. Prodr. i, 296 (1824). Type locality, the island of Unalaska.

Khantaak Island, June 3 (No. 12) and June 27 (No. 48). No. 48 is a robust caulescent plant with flowers, when not shrunken, 18 to 25 mm. long. No. 12 has no well-developed aërial stems, and is a smaller plant than the other, with smaller flowers and more nearly glabrous petals. It blooms, Mr. Funston states, a month earlier than No. 48 and has flowers of a lighter blue. It will be seen that its characters incline toward those of *V. palustris*. No. 12 is abundant throughout the forest region, while No. 48 is said to occur less frequently.

CARYOPHYLLACEÆ.

Cerastium alpinum L. Sp. Pl. i, 438 (1753). Type specimens from Europe.

Disenchantment Bay, August 3 (No. 85) occurring but scantily.

Arenaria lateriflora L. Sp. Pl. i, 423 (1753). Type specimens from Siberia.

Khantaak Island, June 12 (Nos. 18 and 19). These specimens, like others from the northern portions of the range of the species, are of low stature, seldom exceeding 10 cm. in height, and have leaves about 1 cm. in length. In No. 19 the anthers are nearly black and contain a mass of bodies many times smaller than pollen grains, undoubtedly their atrophied and functionless representatives. The same tendency toward the suppression of the stamens is manifested in other herbarium specimens. The plant grew on a sand spit and along a sandy bluff.

Arenaria peploides L. Sp. Pl. i, 423 (1753). The Linnæan plants came from the seashores of northern Europe.

Khantaak Island, June 20 (No. 37). All the Alaskan specimens in the National Herbarium belong to the form described by Torrey and Gray as *Honckenya oblongifolia*. The plant is strictly a littoral species, growing in profusion along gravelly beaches between the line of high tide and the forest. It is very commonly used to produce a smudge to drive away insects.

PORTULACACEÆ.

Claytonia sibirica L. Sp. Pl. i, 204 (1753). Type locality, Siberia.

At the base of Mount Tebenkof, Yakutat Bay, June 22, (No. 42). The plant is abundant along the banks of streams flowing into Disenchantment Bay. For use see page 330.

GERANIACEÆ.

Geranium erianthum DC. Prodr. i, 641 (1824). The species was decribed from specimens collected by David Nelson in Kamchatka and northwestern North America.

Disenchantment Bay, August 10 (No. 100); common on the slopes of the mountains from 550 to 900 meters.

FABACEÆ.

Lupinus nootkatensis unalaskensis Wats. Proc. Amer. Acad. viii, 524 (1873). The type specimens of this variety were collected on the Island of Unalaska.

Khantaak Island, June 20 (No. 35). It was found in abundance also in Disenchantment Bay and on the west side of Yakutat Bay. The National Herbarium contains specimens not only from Unalaska but also from the Shumagin Islands and Kadiak Island.

Lathyrus maritimus (L.) Bigelow, Fl. Bost. ed. 2, 268 (1824); *Pisum maritimum* L. Sp. Pl. ii, 727 (1753). First described from European specimens.

At the mouth of the Ankow River, Yakutat Bay, June 13 (No. 20); abundant on a bare, sandy point.

Lathyrus palustris L. Sp. Pl. ii, 733 (1753). Type locality, Europe.

Khantaak Island, July 27 (No. 77), in the margins of forest openings.

ROSACEÆ.

Luetkea pectinata (Pursh) Kuntze, Rev. Gen. Pl. i, 217 (1891); *Saxifraga pectinata* Pursh, Fl. i, 312 (1814). Type specimen, from the "northwest coast" of North America, collected by Menzies.

Disenchantment Bay, August 5 (No. 90); abundant in the mountains, occurring between 180 and 1,200 meters altitude.

Rubus pedatus Smith, Ic. Pl. Ined. t. 63 (1791). "In Americæ borealis tractu occidentali legit Archibaldus Menzies."

Khantaak Island, June (No. 151); frequent in the moist spruce forests.

Rubus spectabilis Pursh, Fl. i, 348, t. 16 (1814). Pursh described the species from specimens collected by Lewis and Clarke on the banks of the Columbia River, and by Menzies "on the northwest coast."

At the Mission, May 26 (No. 1). For the distribution and uses of this plant, see page 329.

Rubus stellatus Smith, Ic. Pl. Ined. t. 64 (1791). Type locality the same as that of *Rubus pedatus*.

Near the Mission, June 1 (No. 9); common in the damp woods of the lowlands.

Geum calthifolium Smith, in Rees, Cycl. xvi (1819). Type specimen, collected "by Mr. Menzies on the west coast of North America."

Near Dalton Landing, August 16 (No. 130), occurring on a mountain side at an altitude of about 250 meters.

Geum macrophyllum Willd. Enum. i, 557 (1809). Type locality, "in Camtschatca."

Khantaak Island, June 17 (No. 25); a common weed near a deserted Indian village.

Fragaria chiloensis (L.) Lam. Encycl. ii, 537 (1786); *F. vesca chiloensis* L. Sp. Pl. i, 495 (1753). Type locality not given.

Khantaak Island, May 27 (No. 2). This plant has a thick, closely bracteate rootstock and thick, coriaceous leaves, glabrous and impressed-reticulate above, densely villous beneath, as in specimens from the vicinity of San Francisco. For the distribution and uses of this plant, see page 331.

Potentilla anserina L. Sp. Pl. i, 495 (1753). Type locality European.

Near the Mission, June 19 (No. 34). The plant is common but is confined to the beaches, both on the islands and on the mainland. The leaf of *Potentilla anserina* is one example of a type represented in the present collection by three other species, *Fragaria chiloensis*, *Potentilla villosa*, and *Phellopterus littoralis*. In all these plants the leaf is somewhat thickened, rugose and glabrous above, and beneath very densely tomentose or villous. All the species grow upon the naked, sandy beach of the ocean just above the line of high tide, where they are exposed not only to the

moisture-laden air of the region, but to the direct rays of the hot, summer sun, and, probably also, to the influence of the salt water in the soil. The similarity in the leaves of these plants, in the light of their diversity in natural relationship and their subjection to the same environment, is strong evidence of their adaptive modification for a common purpose.

Potentilla palustris (L.) Scop. Fl. Carn. ed. 2, i, 359 (1772); *Comarum palustre* L. Sp. Pl. i, 502 (1753). Type locality, European.

Along the Ankow River, about 10 kilometers from the point where it empties into Yakutat Bay, July 16 (No. 63); growing abundantly in fresh-water swamps near the stream.

Potentilla procumbens (L.) Clairv. Manuel, 166 (1811); *Sibbaldia procumbens* L. Sp. Pl. i, 284 (1753). Described from European specimens.

At Dalton Landing, August 15 (No. 124). The species was nearly past flowering.

Potentilla villosa Pall.; Pursh, Fl. i, 353 (1814). The type specimens, which Pursh saw in the herbarium of Lambert, came from the "northwest coast" of North America. In Ledebour's Flora Rossica the recorded American localities in which specimens were collected by Pallas are the islands of Kadiak and Unalaska.

Found only at a few points in Disenchantment Bay, August 8 (No. 94) and August 10 (No. 103), from sea level to an altitude of 650 meters. At this time the plant was nearly past flowering.

Sanguisorba latifolia nom. nov.; *Sanguisorba canadensis latifolia* Hook. Fl. Bor. Amer. i, 198 (1834); *Sanguisorba sitchensis* C. A. Meyer; Trautv. & Mey. Fl. Ochot. 35 (1856); *Poterium sitchense* Wats. Bibl. Ind. 303 (1878). The plant was described from specimens collected by Scouler at "Observatory Inlet, Northwest coast of America" and by Chamisso at Unalaska.

Along the Ankow River, about 10 kilometers above its mouth, July 16 (No. 66), on the edges of sandy bluffs along the river bank.

Sorbus occidentalis (Wats.) Greene, Fl. Fran. 54 (1891); *Pyrus occidentalis* Wats. Proc. Amer. Acad. xxiii, 263 (1888). The type specimens are from the higher mountains of Washington, Oregon, and California.

Disenchantment Bay, August 5 (No. 92). Only two specimens were seen, forming trees 2 to 3 meters high and growing at an altitude of 250 meters. The plant is referred to *S. occidentalis* with doubt; for while it has leaflets entire for their lower half, like those of that species, its young shoots are densely pubescent with brown hairs and the flowers are unusually large, the petals reaching a length of 5 to 6 mm., and the calyx-throat a breadth of 5 mm. The cymes are 3 to 5 cm. in diameter, and the leaflets nine to thirteen in number, the larger 5 cm. long. The plant is not referable to typical *S. sambucifolia*.

SAXIFRAGACEÆ.

Saxifraga bronchialis L. Sp. Pl. i, 400 (1753). Type locality, Siberia.

Disenchantment Bay, August 5 (No. 91); growing on the mountains at the altitude of from 575 to 1,150 meters. The leaves of this plant present the thick body and thin margins that occur also in *Bryanthus glanduliflorus*.

Saxifraga mertensiana Bong. Veg. Sitch. 141 (1831). Type locality Sitka.

At the base of Mount Tebenkof, June 22 (No. 41); abundant along the bank of a stream.

Saxifraga punctata L. Sp. Pl. i, 401 (1753). Type locality, Siberia.

At the base of Mount Tebenkof, June 22 (No. 40); growing with No. 41.

Saxifraga stellaris L. Sp. Pl. i, 400 (1753). Type locality European.

On the east side of Yakutat Bay, 25 kilometers north of the Mission, July 14 (No. 60); growing along a stream. The name *S. stellaris* is here used for this plant to emphasize the fact that, while commonly referred to *S. leucanthemifolia* of Michaux, now *S. michauxii* Britton, it does not really belong to that species. The type locality

of Michaux's plant is "in excelsis montibus Carolinæ," and it has not been found outside the Alleghany Mountains, although often collected there. European authorities have held that true *S. stellaris* has never been found in America, and that name is here adopted only for convenience.

Tiarella trifoliata L. Sp. Pl. i, 406 (1753). Type locality, northern Asia.

Khantaak Island, June 7 (No. 16), in the spruce forest.

Tellima grandiflora (Pursh) R. Br.; Richards. App. Frankl. Journ. 765 (1823); *Mitella grandiflora* Pursh, Fl. i, 314 (1814). Described from specimens collected on the northwest coast of North America by Menzies.

Disenchantment Bay, August 3 (No. 83); from sea level to an altitude of 150 meters.

Heuchera glabra Willd.; Roem. & Schult. Syst. vi, 216 (1820). Type specimen collected by Pallas in the western part of North America.

On the east shore of Yakutat Bay, 25 kilometers north of the Mission, July 14 (No. 59), along a forest stream.

Parnassia fimbriata Banks; Koenig and Sims, Ann. Bot. i, 391 (1805).

Disenchantment Bay, August 5 (No. 88); abundant on the mountain slopes from 180 to 675 meters of altitude.

Ribes laxiflorum Pursh, Fl. ii, 731 (1814). The original specimens were collected by Menzies "on the northwest coast."

On the east side of Yakutat Bay, near Ocean Cape, May 28 (No. 5).

The species occurs throughout the forest area in the vicinity of Yakutat Bay and is abundant on the foothills of the mountains. On Mount Tebenkof it extends to an altitude of 575 meters. The specimens are nearly past flowering. The use of the name *Ribes americanum* by Miller[1] for the plant commonly known as *R. floridum* prevents the use of Pallas's name *R. americanum*[2] for the present species.

ONAGRACEÆ.

Epilobium latifolium L. Sp. Pl. i, 347 (1753). Type specimen from Siberia.

On the west side of Yakutat Bay, about 7 miles north of Point Manby, June 28 (No. 49), and at Dalton Landing, August 15 (No. 128). The petals in these specimens sometimes attain the length of 2.8 cm. The petals, which are very beautiful and delicate, may be described as of a purplish, but pale, rose color. No. 128 is an albino. The species occurred abundantly on the west side of Yakutat Bay, between the beach and the moraine of the Malaspina Glacier; and along the base of Mount Tebenkof, occasionally rising to an altitude of nearly 500 meters.

Epilobium luteum Pursh, Fl. i, 259 (1814). Type specimen from the "northwest coast" of North America, collected by Pallas.

On the eastern side of Yakutat Bay, about 25 kilometers north of the Mission, July 14 (No. 58); growing along the beach just above the line of high tide. A few specimens were seen afterwards in the same situation in Disenchantment Bay.

Epilobium palustre L. Sp. Pl. i, 348 (1753). Type specimen from Europe.

Near the Mission, July 30 (No. 80); found in but one place. The filiform, subterranean offshoots characteristic of this species are excellently shown in some of the specimens. Like the similar slender organs of *Circæa alpina*, they are well adapted, in this exceedingly moist climate and in the moist, loose stratum of moss, leaves, or light soil through which they push their way, to propagate the plant without the loss of strength incident to a greater outlay of vegetative tissue. In a drier climate or a harder soil, much stouter and better protected structures, and consequently a greater expenditure of vital energy, would be required to accomplish the same result.

Circæa alpina L. Sp. Pl. i, 9 (1753). Type specimen from Europe.

At the mouth of Disenchantment Bay, July 24 (No. 76), among the rocks along the beach.

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[1] Gard. Dict. ed. 8 (1768).

[2] Pallas, Fl. Ross. ii, 34 (1784).

AMMIACEÆ.[1]

Cicuta virosa L. Sp. Pl. i, 255 (1753). Type specimen from Europe.
Khantaak Island, July 22 (No. 71); common in the edges of treeless openings.

Phellopterus littoralis Schmidt, Fl. Sachal. 138 (1868).
Along the Ankow near Ocean Cape, July 1 (No. 51). It occurred only among the sand dunes along the river and on the beach.
[Not before reported from Alaska. J. N. Rose.]

Ligusticum scothicum L. Sp. Pl. i, 250 (1753). Type localities, the seashores of England and Sweden.
Ocean Cape, July 18 (No. 70), on bluffs near the beach.

Selinum gmelini (Cham. & Schlecht.) Kurtz in Engler, Bot. Jarb. xix, 382 (1894); *Ligusticum gmelini* Cham. & Schlecht. Linnæa, i, 391 (1826); *Selinum benthami* Wats. Bibl. Ind. 432 (1878). Type specimens from Alaska.
Cape Phipps, July 23 (No. 73), on a sandy beach near the edge of the forest.

Cœlopleurum gmelini (DC.) Ledeb. Fl. Ross. ii, 361 (1844); *Archangelica gmelini* DC. Prodr. iv, 170 (1830). Type specimens from Kamchatka.
Khantaak Island, June 26 (No. 44); abundant in sunny spots about a deserted Indian village.

Heracleum lanatum Michx. Fl. i, 166 (1803). Type locality, Canada.
Khantaak Island, June 26 (No. 45); abundant on both the island and the mainland, growing along the margins of the forests and in their openings, and extending far up into Disenchantment Bay. For use as food, see page 331.

ARALIACEÆ.

Echinopanax horridum (Smith) Decaisne & Planch. Rev. Hort. 1854, 105 (1854); *Panax horridum* Smith, in Rees, Cycl. xxvi (1819). Type specimen collected by Menzies at Nootka Sound, Vancouver Island.
Khantaak Island, August 30 (No. 143), with mature fruit. The plant, which is popularly known as "devil's club," in May and June bears clusters of white, sweet-scented flowers. It is very common in the woods from sea level to an altitude of 550 meters, and its thick stems, from 0.5 to 2 meters high, covered with stout, spine-like prickles, often render one's progress difficult and painful. It occurs throughout the lowland forests in the vicinity of Yakutat Bay, following them to the altitude of 550 meters on Mount Tebenkof.

CORNACEÆ.

Cornus canadensis L. Sp. Pl. i, 118 (1753). Type locality, Canada.
Khantaak Island, June 15 (No. 23); abundant in the dense lowland woods at the base of Mount Tebenkof, ascending to an altitude of 100 meters. Mature fruit was collected August 27.

CAPRIFOLIACEÆ.

Sambucus racemosa L. Sp. Pl. i, 270 (1753). Type locality, Europe.
Khantaak Island, June 15 (No. 24). See page 329.

Viburnum pauciflorum Pylaie; Torr. and Gr. Fl. ii, 17 (1841). The type specimens were collected in Newfoundland by Pylaie.
Khantaak Island, June 15 (No. 22). Fruiting specimens were collected August 27. For notes on distribution and use, see page 329.

VALERIANACEÆ.

Valeriana sitchensis Bong. Veg. Sitch. 145 (1831). Type specimens from Sitka.
Disenchantment Bay, August 4 (No. 87); abundant on sandy slopes near the beach, and rising to an altitude of 180 meters.

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[1] The Ammiaceæ have been determined by Dr. J. N. Rose.

CARDUACEÆ.

Aster foliaceus Lindl.; DC. Prodr. v, 228 (1836). The type specimens were from Unalaska.

Khantaak Island, July 27 (No. 78), on a bluff along the western side of the island.

Erigeron salsuginosus (Richards.) Gray, Proc. Amer. Acad. xvi, 93 (1881); *Aster salsuginosus* Richards. App. Frankl. Journ. 748 (1823). Type locality, the Salt Plains in Athabasca.

Khantaak Island, June 27 (No. 46); common in openings in the forest.

Antennaria alpina (L.) Gaertn. Fruct. ii, 410 (1791); *Gnaphalium alpinum* L. Sp. Pl. ii, 856 (1753). Type specimens from the Alps of Lapland and Switzerland.

Disenchantment Bay, August 10 (No. 101); ranging from sea level to an altitude of 250 meters.

Antennaria margaritacea (L.) Hook. Fl. Bor. Amer. i, 329 (1834); *Gnaphalium margaritaceum* L. Sp. Pl. ii, 850 (1753); *Anaphalis margaritacea* Benth. & Hook. Gen. Pl. ii, 303 (1873). No more specific localities were assigned for the Linnæan specimens than North America and Kamchatka.

Along the banks of a river flowing into Disenchantment Bay, at a point southeast of Haenke Island, August 11 (No. 106), in sandy soil.

Achillea millefolium L. Sp. Pl. ii, 899 (1753). Type specimens from Europe.

At Ocean Cape, July 18 (No. 69), abundant on the sandy beach; at Point Manby and in Disenchantment Bay, both along the beach and on the hillsides to an altitude of 135 meters. The specimens belong to the boreal type of the plant, which has a darker-colored involucre than the weed of more southern range.

Artemisia norvegica pacifica Gray, Syn. Fl. i, pt. ii, 371 (1884). Range given as from the Arctic coast to the Aleutian Islands, etc. The name of this plant unquestionably must be changed.

Disenchantment Bay, August 8 (No. 93); abundant, occurring from sea level to an altitude of 200 meters. Some of the specimens are very large and robust, reaching 60 cm. in height, the petioles of the basal leaves sometimes 25 cm. long and their blades 13 cm. Its place of growth, on a grassy bank near the beach, undoubtedly accounts for this unusual development.

Arnica latifolia Bong. Veg. Sitch. 147 (1833). Type specimen collected at Sitka by Mertens.

Yakutat Bay, near the Mission, July 30 (No. 79), and at Dalton Landing (No. 122); in the former locality common in open swampy places in the forest, in the latter growing in abundance among the sand dunes along the beach.

Tussilago frigida L. Sp. Pl. ii, 865 (1753). Type locality European.

Disenchantment Bay, August (No. 105); growing in wet, sheltered spots from sea level to an altitude of 75 meters. Our specimens, as well as others from Alaska, do not conform with the typical plant of Europe. The flowering stems reach 40 cm. in height, and the petioles 25 cm.; while the leaf blades, which are usually more nearly reniform than deltoid, with sinuses reaching one-third or one-half the way to the base, attain a breadth of 15 cm. The ligules of the ray flowers are minute and inconspicuous in both kinds of anthodia.

Hieracium triste Willd.; Spreng. Syst. iii, 640 (1826). Type specimen from the Aleutian Islands.

Disenchantment Bay, August 12 (No. 107); at an altitude of 1,000 meters. It occurred sparingly on grassy slopes from this altitude down to sea level, at the lower points bearing mature fruit.

Prenanthes alata (Hook.) Gray, Syn. Fl. i, pt. ii, 435 (1884); *Nabalus alatus* Hook. Fl. Bor. Amer. i, 294, t. 102 (1834). Type locality, Fort Vancouver, Washington.

Disenchantment Bay, August 13 (No. 115); extending abundantly from an altitude of 650 meters down to 450 meters, and sparingly down to 150 meters.

CAMPANULACEÆ.

Campanula rotundifolia alaskana Gray, Syn. Fl. ii, pt. i, 395 (1886). The range given with the description is from the northern Aleutian Islands to Kadiak and Sitka.

Disenchantment Bay, July 10 (No. 56) and August 10 (No. 102); the latter nearly past flowering. The name here used can not properly be applied to this plant under the present principles of nomenclature, but an examination of type specimens is necessary to ascertain its proper designation. No. 56 was found on the side of a steep, rocky bluff, about 25 kilometers north of the Mission. Where No. 102 was collected the species occurred abundantly on the grassy mountain slopes at an altitude of 350 to 675 meters.

ERICACEÆ.

Vaccinium ovalifolium Smith in Rees, Cycl. xxxvi (1819). Type specimen, "brought by Mr. Menzies from the west coast of North America."

At the Mission, May 31 (No. 8). The plant at this date had nearly ceased blooming. Mature fruit was collected August 27. For notes on the distribution and uses of this plant, see page 329.

Cassiope stelleriana (Pall.) DC. Prodr. vii, 611 (1839); *Andromeda stelleriana* Pall. Fl. Ross. ii, 58 t. 74 f. 2 (1790).

Disenchantment Bay, August 12 (No. 110); occurring at an altitude of 300 to 1,000 meters. On the summits of the mountains it is often the only plant to be found. The thick leaves of this plant have thin edges, which character, as is suggested by their position in unfolding, may be due to the pressure of the parts in the bud.

Bryanthus glanduliflorus (Hook.) Gray, Proc. Amer. Acad. vii, 368 (1868); *Menziesia glanduliflorus* Hook. Fl. Bor. Amer. ii, 40, t. 132 (1834). Type specimens collected by Drummond in the alpine woods and mountains north of the Smoking River.

Disenchantment Bay, August 12 (No. 109); on the mountains at the altitude of from 350 to 1,000 meters. The leaves of these Alaskan specimens, which seem to be from the highest latitude in which the species has ever been found, are thinner and more serrate than in specimens from the southern portion of the range of the species. The densely glandular, hirsute corolla and calyx, the short-pilose but not glandular filaments, and the lemon-yellow color of the corolla, distinguish it from the related species. The serrations of the leaves are tipped when young with glands which, like those of the calyx and corolla, afford a resinous-glandular protective covering for the exposed nascent parts of the plant.

Menziesia ferruginea Smith, Ic. Ined. t. 56 (1791).

Khantaak Island, June 10 (No. 26); common in the lowland forests on the mainland and extending to 550 meters on Mount Tebenkof. The filaments in these specimens are conspicuously short-pilose near the base.

Pyrola minor L. Sp. Pl. i, 396 (1753). Type locality European.

Disenchantment Bay, August 14 (No. 86); found at only a single point, in the shade of a clump of alders near the beach.

Pyrola secunda L. Sp. Pl. i, 396 (1753). Type locality European.

On the eastern shore of Yakutat Bay about 30 kilometers north of the Mission, July 14 (No. 57). It was found, but not frequently, at several points in the forest area growing in the moist moss.

Moneses uniflora (L.) Gray, Man. 273 (1848); *Pyrola uniflora* L. Sp. Pl. i, 397. Type locality European.

Ocean Cape, July 9 (No. 54), growing in the moss of a dense forest, and in the mainland forest near Mount Tebenkof.

PRIMULACEÆ.

Trientalis europæa arctica (Fisch.) Ledeb. Fl. Ross. iii, 25 (1847); *T. arctica* Fisch.; Hook. Fl. Bor. Amer. i, 121 (1830). The range given with the original description is from Sandy Bay, in Clarence Straits, to Unalaska, and in Kamchatka.

Between the Mission and Cape Phipps, June 1 (No. 10); of frequent occurrence in the spruce forest.

Glaux maritima L. Sp. Pl. i, 207 (1753). Type locality Europe.

On the mainland near the Mission, June 19 (No. 32); growing in patches on the beach just above the line of high tide. It occurred also on Khantaak Island at the head of Port Mulgrave.

GENTIANACEÆ.

Gentiana amarella L. Sp. Pl. i, 230 (1753). Type specimens from Europe.

Cape Phipps, July 23 (No. 72), and Disenchantment Bay, August 11 (No. 104); at both points growing on the beach. Two forms are represented in these two numbers, the best disposal of which, in the present state of our knowledge concerning the varieties of *G. amarella*, is to refer them to that species without a varietal designation. No. 72 has purplish foliage and stem, blue flowers, and a deeply cleft calyx, the narrow lobes of which are not more than one-half as long as the corolla. No. 104, while very similar in form and size, has green herbage, yellow flowers, and a calyx with more foliaceous divisions, the larger commonly two-thirds to three-fourths as long as the corolla.

Gentiana platypetala Griseb. Gent. 191 (1839). The type specimens were collected on the island of Sitka during the second expedition of Kotzebue in the early part of the present century, and none have been reported since.

Disenchantment Bay, August 12 (No. 108). It has been impossible to compare ours with the original specimens, yet from Grisebach's description we appear to have the same plant. It closely resembles small specimens of *G. calycosa*, the stems being 15 to 22 cm. high and bearing 6 to 10 pairs of ovate-oblong, obtuse or bluntly acute leaves. Each stem is terminated by a single sessile flower involucrately surrounded by 2 or 3 pairs of leaves, the inner reduced. The calyx, which is about one-half as long as the tube of the campanulate blue corolla, has a spathaceous membranaceous tube 10 to 14 mm. long, which usually spreads open along two opposite lines nearly to the base, the free margins being thin, scarious, and apparently not torn. The calyx lobes proper are minute, lanceolate, acute, herbaceous organs about 3 mm. long. The corolla lobes are conspicuously narrower at their insertion, broader than long, and abruptly acuminate, while the plaits in the sinuses are triangular, broader than high, and acute or emarginate.

Menyanthes trifoliata L. Sp. Pl. i, 145 (1753). Type locality European.

Khantaak Island, June 20 (No. 39); common in fresh-water ponds, growing both in the water and on the adjacent wet soil.

HYDROPHYLLACEÆ.

Romanzoffia sitchensis Bong. Veg. Sitch. 158 (1831). Type locality, Sitka.

Near Dalton Landing, August 15 (No. 123), growing among shaded rocks in a canyon leading from the St. Elias range. This plant so closely resembles a small saxifrage, *Saxifraga nudicaulis* for example, that a critical look at the corolla is necessary to distinguish it. Even the thickened bases of the petioles and the two divergent carpels of the mature fruit precisely simulate those of certain saxifrages, yet they have the most widely different genetic relation.

BORAGINACEÆ.

Pneumaria maritima (L.) Hill, Veg. Syst. vii, 40 (1764); *Pulmonaria maritima* L. Sp. Pl. i, 136 (1753). Type locality, the sandy beaches of England.

On the west side of Yakutat Bay, about 10 kilometers north of Point Manby, June 28 (No. 50). Around Disenchantment Bay, also, the plant is common, and, as at the other locality, confined to the sandy beach.

SCROPHULARIACEÆ.

Mimulus langsdorfii Donn; Sims, Bot. Mag. t. 1501 (1812). Description drawn from specimens grown in the Botanic Garden at Cambridge, England, the seed coming "from Unashka [Unalaska], one of the Fox Islands." This is the *Mimulus luteus* of most American authors.

On the east side of Yakutat Bay, 26 kilometers north of the Mission, July 14 (No. 55), along a stream in dense woods; and again on a small stream emptying into Disenchantment Bay.

Veronica alpina L. Sp. Pl. i, 11 (1753). Type locality European.

Disenchantment Bay, August 9 (No. 97), near a water course; found but sparingly.

Castilleja miniata Dougl.; Hook. Fl. Bor. Amer. ii, 106 (1838). Type specimens from the Blue Mountains of Oregon.

On a sandy point at the mouth of the Ankow River, June 13 (No. 21), and in Disenchantment Bay, August 3 (No. 82); the former with yellowish, the latter with red bracts. The plant is abundant in the valleys and lowlands about Yukutat Bay, and occurs occasionally up to an altitude of 550 meters.

Castilleja parviflora Bong. Veg. Sitch. 158 (1831). Type specimens collected near Sitka.

Disenchantment Bay, August 5 (No. 89); found in but one place, on the southern slope of a mountain, about 600 meters above the sea. These specimens were thus identified by the late Mr. H. E. Seaton.

Euphrasia officinalis L. Sp. Pl. ii, 604 (1753). Type specimens from Europe.

Dalton Landing, August 15 (No. 125); common in sandy soil of the beach. The specimens have less spinescent leaves and smaller flowers than the typical European plant.

Pedicularis palustris wlassowiana (Steven) Bunge, in Ledeb. Fl. Ross. iii, 283 (1847); *P. wlassowiana* Steven, Mon. Pedic. 27, t. 9, fig. 1 (1822).

At the entrance of Disenchantment Bay, July 24 (No. 75); growing along a sandy beach just above the line of high tide. The lower lip in these specimens is unusually short, not more than one-half as long as the galea.

Pedicularis sudetica Willd. Sp. Pl. iii, 209 (1800). Described from plants collected in the Sudetic Mountains and in Siberia.

Disenchantment Bay, August 9 (No. 98); from sea level to an altitude of 120 meters.

Rhinanthus crista-galli L. Sp. Pl. ii, 603 (1753). Type locality European.

Ocean Cape, July 18 (No. 68), and at Dalton Landing; growing in both stations on the sandy beach.

POLYGONACEÆ.

Polygonum viviparum L. Sp. Pl. i, 360 (1753). Type locality, European.

On a bluff along the Ankow River, about 10 kilometers above its mouth, July 16 (No. 65), and on the shores of Disenchantment Bay, 200 meters above the sea.

FAGACEÆ.

Alnus rubra Bong. Veg. Sitch., 162 (1831). The type specimen was collected at Sitka by Mertens.

Khantaak Island, May 27 (No. 3). For the distribution of this plant, the red alder, see page 328.

SALICACEÆ.

Salix arctica Pall. Fl. Ross. i, pt. ii, 86 (1788). Type locality "in plaga arctica muscosa nuda secundum Sinum Obensem et versus glacialem Oceanum."

Disenchantment Bay, August 13 (No. 117). This willow, according to Mr. Funston's notes, is common on the rocky mountain slopes about Disenchantment Bay, extending from sea level to the limit of vegetation. These specimens have obovate to orbicular, glabrous, reticulated leaves, glaucous beneath, rounded at the base, the blades of the larger ones 2 to 2.5 cm. long. They bear mature fruit, the capsules glabrous. This form of *Salix arctica* is not known in the United States proper. Our specimens have a short, thick, woody trunk, often 1 cm. in diameter and two to three times as long, scarcely rising above the surface of the ground. From this trunk arise lateral branches 10 to 30 cm. in length, which retain their vitality only a few years, spreading on the ground and ascending to the height of a few centimeters. The trunk is firmly fixed in the ground by means of stout roots.

Salix barclayi Anders. Proc. Amer. Acad. iv, 66 (1858). The type specimens were collected on Kadiak Island by Barclay.

Khantaak Island, May 30 (No. 6). For notes on this species, see page 328.

ORCHIDACEÆ.

Habenaria bracteata (Willd.) R. Br.; Ait. Hort. Kew. ed. 2, v, 192 (1813); *Orchis bracteata* Willd. Sp. Pl. iv, 34 (1805). Type specimen from Pennsylvania.

Disenchantment Bay, August 12 (No. 112). Scattered specimens were found from sea level to an altitude of more than 1,000 meters.

Habenaria dilatata (Pursh) Hook. Exot. Fl. ii, 95 (1825); *Orchis dilatata* Pursh, Fl. ii, 588 (1814). Type specimen from Labrador.

Along the Ankow River, near Ocean Cape, July 1 (No. 52). The plant grows in moist, shaded parts of the forest region; and its snow-white flowers, according to Mr. Funston's observations, are very fragrant. Determined by Thomas Morong.

Habenaria hyperborea (L.) R. Br.; Ait. Hort. Kew. v, 193 (1813); *Orchis hyperborea* L. Mant i, 121 (1767).

Along the Ankow River, about 10 kilometers above its mouth, July 16 (No. 64); abundant in fresh-water swamps. Determined by Thomas Morong.

IRIDACEÆ.

Iris setosa Pall.; Link, Jahresb. i, pt. iii, 71 (1841).

At the mouth of the Ankow River, July 3 (No. 53), in sandy soil near a fresh-water pond. The Indians are said to use the rootstock as a medicinal charm.

LILIACEÆ.

Streptopus amplexifolius (L.) Lam. & DC. Fl. Franc. iii, 174 (1805); *Uvularia amplexifolia* L. Sp. Pl. i, 304 (1753). Type locality, European.

About 25 kilometers north of the Mission, July 14 (No. 61); common in the dense woods, and on Mount Tebenkof found at the altitude of 180 meters. Fruiting specimens were collected on Khantaak Island, August 27.

Fritillaria camschatcensis (L.) Ker, Bot. Mag. under t. 1216 (1809); *Lilium camschatcensis* L. Sp. Pl. i, 303 (1753). Type locality, Kamchatka.

Khantaak Island, June 20 (No. 38). It occurs in openings throughout the lowland forest area in the vicinity of Yakutat Bay, ascending on Mount Tebenkof to an altitude of 900 meters. The use of this plant for food is recorded in Hooker's Flora Boreali-Americana, p. 181, as follows: "Voyagers to Kamtschatka (where this species seems more abundant than on the American coast) bring home small, white, granulated esculent roots, dried on strings. These are the bitter tubers of this *Fritillary*,

which are also copiously eaten by the Indians of Stikine, and known by the names of *Koch* or *N. W. Rice;* but Mr. Toline says they are bitter and nauseous." For the use of the plant among the Thlinkets, see page 330.

Tofieldia glutinosa (Michx.) Pers. Syn. i, 399 (1805); *Narthecium glutinosum* Michx. Fl. i, 210 (1803). Type specimen collected between Quebec and Lake Mistassinie.

Khantaak Island, June 27 (No. 47), along the margin of a fresh-water marsh.

JUNCACEÆ.

Juncus falcatus alaskensis var. nov.; probably *J. falcatus sitchensis* Buch. Monog. Junc. 428 (1890), not *J. arcticus sitchensis* Engelm. (1866). Type specimen in the United States National Herbarium, collected July 18, 1892, at Ocean Cape, Yakutat Bay, Alaska, by Frederick Funston (No. 67), growing in openings in the forest.

In the typical form of the species, which was originally collected at Monterey, California, and which seems to range as far northward as Puget Sound, the styles are long, the stigmas conspicuously exserted, and the anthers much longer than their filaments, as in *J. orthophyllus*, but specimens collected at various points from Yakutat Bay, Alaska, to the Aleutian Islands have a very short, thick style, and anthers little longer than their filaments. No fruiting specimens have been seen, but the plant is doubtless the same as Dr. Buchenau's variety *sitchensis*, which was described, presumably from Alaskan specimens, as having a retuse obcordate capsule instead of the obtuse ovate one of the type form. The plant occurs on the Aleutian islands, Atka and Unalaska, on the Shumagin Islands, at Yakutat Bay, and perhaps farther southward along the Alaskan coast.

Juncoides campestre sudeticum (Willd.) Coville, Contr. Nat. Herb. iv, 208 (1893); *Juncus sudeticus* Willd. Sp. Pl. ii, 221 (1799); *Luzula campestris sudetica* Celakovsky, Prodr. Fl. Bœhm. 749 (1881). Type locality, the summit of the Sudetic Mountains, of Silesia.

Knight Island, June 18 (No. 28), growing on bare, well-drained sandy points.

CYPERACEÆ.

Eleocharis watsoni Babb. Ann. & Mag. Nat. Hist. ser. 2, x, 20 (1852). Type specimen collected on the seacoast of Scotland, near Tayanloan, Argyleshire.

Along the Ankow River, August 28 (No. 135); abundant along the margins of lagoons and fresh-water swamps. Mr. C. B. Clarke[1] has disposed of this species as a variety, *watsoni*, of *E. palustris;* but if our specimens are fairly representative of the plant, it appears much more satisfactory to treat it as a distinct species. They have culms 20 to 40 cm. high, spikes at maturity 4 to 6 mm. in diameter and 7 to 15 mm. long, bracts of the spike black, with hyaline margins, and setæ equaling the nutlet. The plant was identified by Dr. N. L. Britton.

Carex decidua[2] Boott, Proc. Linn. Soc. i, 255 (1845). Type specimens from the Falkland Islands and from Port Famine, Straits of Magellan.

On the Ankow River, August 28 (No. 134); common in fresh-water swamps and along the edges of lagoons.

Carex festiva pachystachya Bailey, Mem. Torr. Club, i, 51 (1889).

Mainland, near Mission, Yakutat Bay, June 19 (No. 30); found wherever there is no shade. Common on the Ankow.

Carex limosa stygia (Fries) Bailey, Proc. Amer. Acad. xxii, 95 (1887); *C. stygia* Fries, Mant. iii, 141 (1842).

Knight Island, June 18 (No. 27); common along the edges of fresh-water ponds on the mainland and islands of the bay.

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[1] Journal of Botany, xxv, 268 (1887).

[2] The specimens of Carex were determined by Professor L. H. Bailey.

POACEÆ.[1]

Savastana odorata (L.) Scribn. Mem. Torr. Club, v, 31 (1894); *Holcus odoratus* L. Sp. Pl. ii, 108 (1753); *Hierochloa borealis* Roem. & Schult. Syst. ii, 513 (1817). Type specimens from Europe.

Khantaak Island, June 20 (No. 36); found along the edges of bluffs about 6 meters above sea level.

Phleum alpinum L. Sp. Pl. i, 59 (1753). Type specimens from Europe.

On dry sand bars along streams, from sea level to 60 meters elevation. Abundant at Dalton Landing, August 16 (No. 119); a few scattering specimens on Khantaak Island.

Agrostis exarata Trin. Diss. i, 207 (1824). Type locality, Unalaska.

Growing in scattered clumps on dry sand bars along small rivers which empty into the sea. Disenchantment Bay, August 17 (No. 118); from sea level to 60 meters elevation..

Calamagrostis langsdorffii (Link.) Trin. Gr. Unifl. 225 (1824); *Arundo langsdorffii* Link, Enum. i, 74 (1821). Type locality, Siberia.

Ankow River, August 28 (No. 136); found generally along the beach near the edge of the forest, and on bluffs near the rivers.

Deschampsia cæspitosa (L.) Beauv. Agrost. 91 (1812); *Aira cæspitosa* L., Sp. Pl. i, 64 (1753). Type specimen from Europe.

Yakutat Bay, August 27 (No. 133); found everywhere in the vicinity of Yakutat Bay, often in great abundance. It occupies all the open, but not swampy, spaces in the forests, and is found in abundance on the bluffs near the seashore and on the southern slope of Mount Tebenkof, to an altitude of 525 meters.

Deschampsia cæspitosa longiflora (Trin.) Vasey, Descr. Cat. Gr. 29 (1883); *Aira cæspitosa longiflora* Trin; Thurb. Bot. Wilkes Exped. xvii, 487 (1873–74). Type locality, "Nisqually and the north branch of the Columbia."

Disenchantment Bay, August 12 (No. 111); found in large quantities on the slopes of mountains, at from 250 to 775 meters altitude, between the upper limit of red alder and the lower limit of summer snow, where it gives the mountains their light-green color. Some tracts of hundreds of acres of mountain slope are covered with it, to the exclusion of all other vegetation. It is not found in the forest country.

Poa alpina L. Sp. Pl. i, 67 (1753). Type specimen from Europe.

Dalton Landing, August 15 (No. 127); growing abundantly in small clusters on dry sand bars near Dalton Creek; also found near Cape Manby.

Poa glumaris Trin. Mem. Acad. St. Petersb. ser. 6, i, 379 (1831). Type locality, Arctic Siberia.

Khantaak Island, August 29 (No. 137); common on gravelly beaches out of reach of high tides.

Puccinellia maritima (Huds.) Parl. Fl. Ital. i, 370 (1848); *Poa maritima* Huds. Fl. Angl. 42 (1762).

On the mainland near the Mission, at sea level; also on the beach at the base of Mount Tebenkof, June 21 (No. 31); found only near the beach, where it grows in dense clumps; not common.

Elymus arenarius L. Sp. Pl. i, 83 (1753). Type specimen from Europe.

Near the Mission, August 29 (No. 140); abundant along sandy beaches, but found only near the sea. The thick culms play an important part in the basket making of the Thlinket Indians. When green they are cut, stripped of leaves, and dried near a fire. They are then used to form the uprights or framework around which are woven split spruce roots.

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[1] Determined by the late Dr. George Vasey.

PINACEÆ.

Picea sitchensis (Bong.) Carr. Trait. Con. 260 (1855); *Pinus sitchensis* Bong. Veg. Sitch. 164 (1831). Type specimen from Sitka.

Khantaak Island, August 27 (No. 131). The specimens bear well-developed cones with nearly mature seeds. For the distribution and uses of the tree, see pages 328 and 334.

Tsuga mertensiana (Bong.) Carr. Trait. Con. ed. 2, 250 (1867); *Pinus mertensiana* Bong. Veg. Sitch. 163 (1831). Type specimens collected at Sitka by Mertens.

Yakutat Bay, August 27 (No. 132). For notes on this tree, see page 328.

Chamæcyparis nootkatensis (Lamb.) Spach, Hist. Veg. xi, 333 (1842); *Cupressus nootkatensis* Lamb. Pin. ii, 18 (1824).

Khantaak Island, September (No. 147). The specimens bear mature cones with fully grown seeds, in many cases capable of germination. Only a single individual of this, the Sitka cypress, was seen by Mr. Funston in the territory that he traversed. The tree does not follow in its range the same course as *Picea sitchensis*, but in the southern portion of its range, in Oregon, is found remote from the coast in the region of the Cascade Mountains.

LYCOPODIACEÆ.

Lycopodium alpinum L. Sp. Pl. ii, 1104 (1753). Type locality European.

Growing in abundance, but at only one place, on the bleak summit of a mountain 1,175 meters high, on the mainland southeast of Haenke Island. Collected August 13 (No. 113). At the base of some of the branches the complanate character of the stem and leaves is very marked, but in most parts of the plant this character is not seen.

Lycopodium annotinum L. Sp. Pl. ii, 1103 (1753). Type locality European.

Near the Mission, August 29 (No. 139); abundant throughout the lowland forest, growing on decayed logs and in other similar soil.

EQUISETACEÆ.

Equisetum variegatum Schleich. Cat. Pl. Helv. ed. 2, 27 (1807).

Khantaak Island, August 30 (No. 142); common near the fresh-water swamps. Determined by L. M. Underwood.

POLYPODIACEÆ.

Polypodium vulgare L. Sp. Pl. ii, 1085 (1753). Type locality European.

Near the Mission, June 6 (No. 13). The species is common throughout the forested area.

Cryptogramme acrostichoides R. Br.; Richards. App. Frankl. Journ. 754 (1823). The plant is more fully described in Brown's Addenda to the same work (p. 767), where it is stated that the specimens were found by Menzies at Nootka Sound, Vancouver Island.

Dalton Landing, August 16 (No. 129); abundant among rocks.

Dryopteris spinulosa (Retz.) Kuntze, Rev. Gen. Pl. ii, 810 (1891); *Polypodium spinulosum* Retz. Fl. Scand. ed. 2, 250 (1795); *Aspidium spinulosum* Swartz; Schrad. Journ. Bot. ii, 38 (1800).

Near the Mission, June 19 (No. 33). The sporangia are immature at this season. This fern grows in the greatest profusion in the damp mossy woods about the Mission. On Mount Tebenkof, up to an altitude of 600 meters, certain areas were densely covered with the plant.

Phegopteris dryopteris (L.) Fee, Gen. Fil. 243 (1850–1852); *Polypodium dryopteris* L. Sp. Pl. ii, 1093 (1753). Type specimen from Europe.

Near the Mission, August 29 (No. 138). This fern grows in the greatest profusion in the spruce forest of the lowlands about Yakutat Bay. On Mount Tebenkof it was found at an altitude of 380 meters.

Dryopteris lonchitis (L.) Kuntze, Rev. Gen. Pl. ii, 813 (1891); *Polypodium lonchitis* L. Sp. Pl. ii, 1088 (1753); *Aspidium lonchitis* Swartz; Schrad. Journ. Bot. ii, 38 (1800). Type locality, the mountains of Europe.

Near the cabin, about 3 kilometers from Dalton Landing, August 15 (No. 126). Only one specimen was seen.

Cystopteris fragilis (L.) Bernh. Neues Journ. Bot. i, pt. ii, 26 (1806); *Polypodium fragile* L. Sp. Pl. ii, 1091 (1753). Type specimens from Europe.

Disenchantment Bay, August 14 (No. 120); found sparingly on the cliffs near the beach. Determined by L. M. Underwood.

BRYACEÆ.[1]

Polytrichum attenuatum Menz.; *P. formosum* Hedw. Khantaak Island and mainland near the Mission (No. 17); common around the bases of trees and on decaying logs.

Polytrichum urnigerum L.; *Pogonatum urnigerum* Drum. Collected with the preceding (No. 152).

Astrophyllum punctatum (L.) Lindb.; *Mnium punctatum* Hedw. Khantaak Island (Nos. 62 and 145); on decaying tree trunks, in shaded places.

Dicranum fragilifolium Lindb. Khantaak Island (No. 154); growing on decaying tree trunks.

Dicranum fuscescens Turn. Khantaak Island (No. 149); common on the bark of *Alnus rubra.*

Dicranum majus Turn. In woods on Khantaak Island (No 157).

Ceratodon purpureus (L.) Brid. Khantaak Island (No. 159).

Ulota barclayi Mitt. Khantaak Island (No. 158); on the bark of *Alnus rubra.*

Climacium ruthenicum Lindb. Khantaak Island (No. 153).

Brachythecium lætum (Brid.) Bruch & Schimp.; *Hypnum lætum* Brid. Khantaak Island (No. 156).

Hylocomium loreum (L.) Bruch & Schimp.; *Hypnum loreum* L. Khantaak Island (No. 146). Growing with *Hylocomium squarrosum.*

Hylocomium proliferum (L.) Lindb.; *Hypnum splendens* Hedw. Common in the woods on Khantaak Island (No. 148).

Hylocomium squarrosum (L.) Bruch & Schimp.; *Hypnum squarrosum* L. Khantaak Island (No. 155). This moss is abundant in the forests around Yakutat Bay, growing on tree trunks and stumps. The highest point at which it was noted was 150 meters above sea level on the side of Mount Tebenkof.

Hypnum arcuatum Lindb. Khantaak Island (No. 160); growing with *Hylocomium proliferum.*

Hypnum circinale Hook. Khantaak Island (No. 150); growing on decaying logs.

Hypnum uncinatum Hedw. Khantaak Island (No. 144); growing on decaying tree trunks.

SPHAGNACEÆ.[2]

Sphagnum squarrosum semisquarrosum Russ. Khantaak Island (No. 141). This moss grows in abundance along the borders of bogs and swamps, both on the island and on the mainland.

---

[1] Determined by J. M. Holzinger.

[2] Determined by Dr. Christian Warnstorf.

JUNGERMANNIACEÆ.[1]

Blepharostoma trichophyllum (L.) Dum. Near Yakutat Bay (No. 161).

Cephalozia divaricata (Sm.) Dum. Near Yakutat Bay (No. 162).

Cephalozia multiflora Spruce. Near Yakutat Bay (No. 163).

Frullania nisquallensis Sulliv. Near Yakutat Bay (No. 164).

Kantia trichomanis (L.) S. F. Gray. Near Yakutat Bay (No. 165).

Lepidozia reptans (L.) Dum. Near Yakutat Bay (No. 166).

Plagiochila asplenioides (L.) Dum. Near Yakutat Bay (No. 167).

Radula krausei Steph. Near Yakutat Bay (No. 168).

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[1] Among the mosses collected by Mr. Funston were detected several fragments of Hepaticæ, which have been determined by Mr. A. W. Evans.

LIST OF SPECIMENS.

1. Rubus spectabilis Pursh.
2. Fragaria chiloensis (L.) Lam.
3. Alnus rubra Bong.
4. Caltha palustris L.
5. Ribes laxiflorum Pursh.
6. Salix barclayi Anders.
7. Cardamine oligosperma Nutt.
8. Vaccinium ovalifolium Smith.
9. Rubus stellatus Smith.
10. Trientalis europæa arctica (Hook.) Fisch.
11. Coptis trifolia (L.) Salisb.
12. Viola langsdorfii Fisch.
13. Polypodium vulgare L.
14. Actæa spicata arguta (Nutt.) Torr.
15. Arabis hirsuta (L.) Scop.
16. Tiarella trifoliata L.
17. Polytrichum attenuatum Menz.
18. Arenaria lateriflora L.
19. Arenaria lateriflora L.
20. Lathyrus maritimus (L.) Bigel.
21. Castilleja miniata Benth.
22. Viburnum pauciflorum Pylaie.
23. Cornus canadensis L.
24. Sambucus racemosa L.
25. Geum macrophyllum Willd.
26. Menziesia ferruginea Smith.
27. Carex limosa stygia (Fries) Bailey.
28. Juncoides campestre sudeticum (Willd.) Coville.
29. Ranunculus nelsonii (DC.) Gray.
30. Carex festiva pachystachya Bailey.
31. Puccinellia maritima (Huds.) Parl.
32. Glaux maritima L.
33. Dryopteris spinulosa (Retz.) Kuntze.
34. Potentilla anserina L.
35. Lupinus nootkatensis unalaskensis Wats.
36. Sayastana odorata (L.) Scribn.
37. Arenaria peploides L.
38. Fritillaria camschatcensis (L.) Ker.
39. Menyanthes trifoliata L.
40. Saxifraga punctata L.
41. Saxifraga mertensiana Bong.
42. Claytonia sibirica L.
43. Nymphæa polysepala (Engelm.) Greene.
44. Cœlopleurum gmelini (DC.) Ledeb.
45. Heracleum lanatum Michx.
46. Erigeron salsuginosus (Richards.) Gray.
47. Tofieldia glutinosa (Michx.) Pers.
48. Viola langsdorfii Fisch.
49. Epilobium latifolium L.
50. Pneumaria maritima (L.) Hill.
51. Phellopterus littoralis Schmidt.
52. Habenaria dilatata (Pursh) Hook.
53. Iris setosa Pall.
54. Moneses uniflora (L.) Gray.
55. Mimulus luteus L.
56. Campanula rotundifolia alaskana Gray.
57. Pyrola secunda L.
58. Epilobium luteum Pursh.
59. Heuchera glabra Willd.
60. Saxifraga stellaris L.
61. Streptopus amplexifolius (L.) DC.
62. Astrophyllum punctatum (L.) Lindb.
63. Potentilla palustris (L.) Scop.
64. Habenaria hyperborea (L.) R. Br.
65. Polygonum viviparum L.
66. Sanguisorba latifolia (Hook.) Coville.
67. Juncus falcatus alaskensis Coville.
68. Rhinanthus crista-galli L.
69. Achillea millefolium L.
70. Ligusticum scothicum L.
71. Cicuta virosa L.
72. Gentiana amarella L.
73. Selinum gmelini (Cham. & Schlecht.) Kurtz.
74. Viola glabella Nutt.
75. Pedicularis palustris wlassoviana (Steven) Bunge.
76. Circæa alpina L.
77. Lathyrus palustris L.
78. Aster foliaceus Lindl.
79. Arnica latifolia Bong.
80. Epilobium palustre L.
81. Ranunculus reptans L.
82. Castilleia miniata (Benth.) Dougl.
83. Tellima grandiflora (Pursh) R. Br.
84. Arabis lyrata L.
85. Cerastium alpinum L.
86. Pyrola minor L.
88. Parnassia fimbriata Koenig.
87. Valeriana sitchensis Bong.
89. Castilleja parviflora Bong.
90. Luetkea pectinata (Pursh) Kuntze.
91. Saxifraga bronchialis L.
92. Sorbus occidentalis (Wats.) Greene.
93. Artemisia norvegica pacifica Gray.
94. Potentilla villosa Pall.
95. Barbarea barbarea (L.) McMillan.
96. Draba stenoloba Ledeb.
97. Veronica alpina L.
98. Pedicularis sudetica Willd.
99. Ranunculus cooleyæ Vasey & Rose.
100. Geranium erianthum DC.
101. Antennaria alpina (L.) Gaertn.
102. Campanula rotundifolia alaskana Gray.
103. Potentilla villosa Pall.
104. Gentiana amarella L.
105. Tussilago frigida L.
106. Antennaria margaritacea (L.) Hook.

107. Hieracium triste Willd.
108. Gentiana platypetala Griseb.
109. Bryanthus glanduliflorus (Hook.) Gray.
110. Cassiope stelleriana (Pall.) DC.
111. Deschampsia cæspitosa longiflora Trin.
112. Habenaria bracteata (Willd.) R. Br.
113. Lycopodium alpinum L.
114. Anemone narcissiflora L.
115. Prenanthes alata (Hook.) Gray.
116. Aconitum delphinifolium DC.
117. Salix arctica Pall.
118. Agrostis exarata Trin.
119. Phleum alpinum L.
120. Cystopteris fragilis (L.) Bernh.
121. Aquilegia formosa Fisch.
122. Arnica latifolia Bong.
123. Romanzoffia sitchensis Bong.
124. Potentilla procumbens (L.) Clairv.
125. Euphrasia officinalis L.
126. Dryopteris lonchitis (L.) Kuntze.
127. Poa alpina L.
128. Epilobium latifolium L.
129. Cryptogramme acrostichoides R. Br.
130. Geum calthifolium Smith.
131. Picea sitchensis (Bong.) Carr.
132. Tsuga mertensiana (Bong.) Carr.
133. Deschampsia cæspitosa (L.) Beauv.
134. Carex decidua Boott.
135. Eleocharis watsoni Babb.
136. Calamagrostis langsdorfii (Link) Trin.
137. Poa glumaris Trin.
138. Phegopteris dryopteris (L.) Fee.
139. Lycopodium annotinum L.
140. Elymus arenarius L.
141. Sphagnum squarrosum semisquarrosum Russ.
142. Equisetum variegatum Schleich.
143. Echinopanax horridum Smith.
144. Hypnum uncinatum Hedw.
145. Astrophyllum punctatum (L.) Lindb.
146. Hylocomium loreum (L.) Bruch & Schimp.
147. Chamæcyparis nootkatensis (Lamb.) Spach.
148. Hylocomium proliferum (L.) Lindb.
149. Dicranum fuscescens Turn.
150. Hypnum circinale Hook.
151. Rubus pedatus Smith.
152. Polytrichum urnigerum L.
153. Climacium ruthenicum Lindb.
154. Dicranum fragilifolium Lindb.
155. Hylocomium squarrosum (L.) Bruch & Schimp.
156. Brachythecium lætum (Brid.) Bruch & Schimp.
157. Dicranum majus Turn.
158. Ulota barclayi Mitt.
159. Ceratodon purpureus (L.) Brid.
160. Hypnum arcuatum Lindb.
161. Blepharostoma trichophyllum (L.) Dum.
162. Cephalozia divaricata (Sm.) Dum.
163. Cephalozia multiflora Spruce.
164. Frullania nisquallensis Sulliv.
165. Kantia trichomanis (L.) S. F. Gray.
166. Lepidozia reptans (L.) Dum.
167. Plagiochila asplenioides (L.) Dum.
168. Radula krausei Steph.

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U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF BOTANY.

CONTRIBUTIONS

FROM

THE U. S. NATIONAL HERBARIUM.

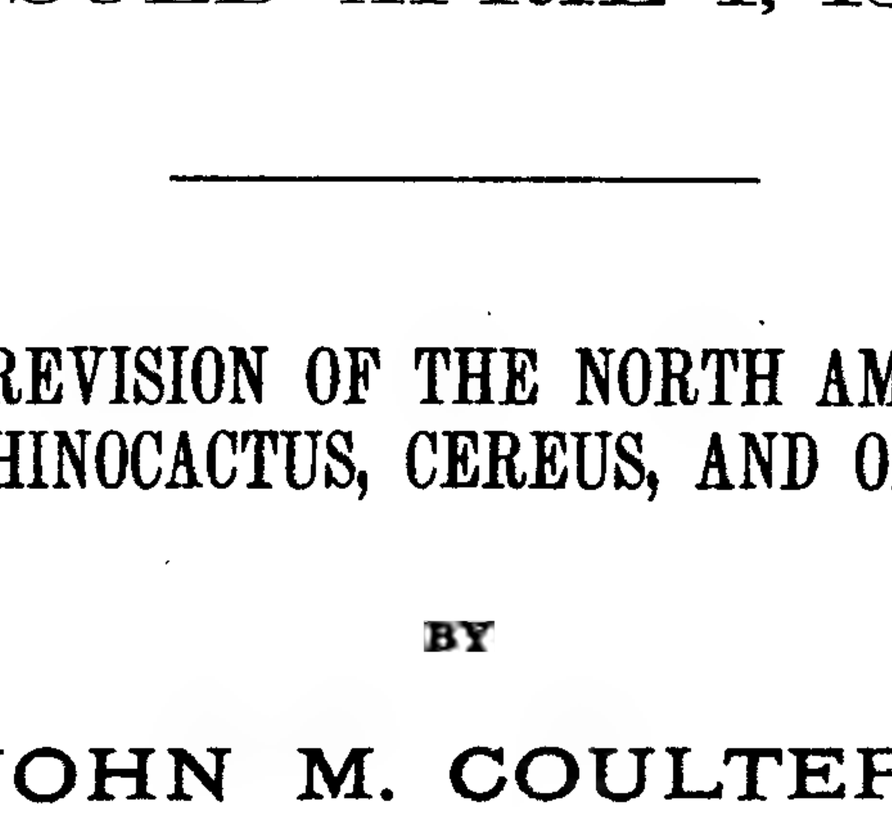
Vol. III, No. 7.

ISSUED APRIL 1, 1896.

PRELIMINARY REVISION OF THE NORTH AMERICAN SPECIES OF ECHINOCACTUS, CEREUS, AND OPUNTIA.

BY

JOHN M. COULTER.



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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF BOTANY,
Washington, D. C., December 20, 1895.

SIR: I have the honor to transmit herewith for publication Volume III, No. 7, Contributions from the United States National Herbarium, consisting of the final part of a preliminary revision of the North American species of Cactaceæ.

Respectfully,

FREDERICK V. COVILLE,
Botanist.

Hon. J. STERLING MORTON,
Secretary of Agriculture.

PRELIMINARY REVISION OF THE NORTH AMERICAN SPECIES OF ECHINOCACTUS, CEREUS, AND OPUNTIA.

PREFATORY NOTE.

This is the completion of the work on our North American Cactaceæ, which was begun by the preliminary revision of Cactus, Anhalonium, and Lophophora, published as Contributions from the U. S. National Herbarium, Vol. III, No. 2 (issued June 10, 1894). The occasion for such an undertaking and the opportunities for carrying it out were explained in the prefatory note to that paper. As the work progressed, however, it became more and more evident that the revision could consist only of the systematic collection of our present knowledge, based upon the study of the very inadequate material accessible in herbaria and gardens. The difficulties of the group, as regards types and nomenclature, were pointed out in the previous paper, and the undertaking would have been abandoned only that it seemed but proper to contribute to the knowledge of the group such facts as had come to light in the course of several years' study, especially as an excellent opportunity had been given to examine Dr. Engelmann's types and unpublished notes. It may be well to repeat the statement here that all known forms within the United States have been included, but only such Mexican and West Indian forms as could be personally examined. A maze of names and descriptions have been handed down in various writings, but it would be of no advantage to introduce them except as substantiated by specimens.

JOHN M. COULTER.

UNIVERSITY OF CHICAGO.

4. ECHINOCACTUS Link & Otto, Verh. Preuss. Gartenb. Ver. 3, 420, t. 13 (1827).

Usually globose, but becoming oblong or even stout-cylindrical, mostly with spine-bearing ribs (sometimes represented only by vertical or spiral rows of tubercles): flower-bearing areolæ usually contiguous to the young spine-bearing areolæ and just above them, but sometimes further removed (connected with them by a short groove), and rarely even in the axil of a tubercle: ovary bearing scales which are naked or woolly in the axils: fruit succulent or dry: seeds often albuminous: embryo usually curved, with more or less foliaceous cotyledons.—*Astrophytum* Lem. (1839); *Gymnocalycium* Pfeiff. (1844); *Malacocarpus* Salm-Dyck (1850).

As the genera of *Cactaceæ* have no very definite boundaries it is to be expected that *Echinocactus* will be found merging into neighboring genera. The mamillate forms, such as *E. simpsoni*, are clearly intermediate between *Cactus* and *Echinocactus*, but are nearer the latter in what are considered the more essential characters; while the oval and cylindric forms look toward certain species of *Cereus*, though the general globose outline is well maintained. Inasmuch as the flowers are related to the nascent spiniferous areolæ the *Cactus* relationship is with the Coryphanths, among which, as has been pointed out, *Cactus macromeris* has its *Echinocactus* tendencies. The genus *Cereus* holds the same sort of relationship to the Eumamillarias, the flowers in both appearing in connection with the mature spiniferous areolæ. As shown recently by W. F. Ganong,[1] the so-called floriferous and spiniferous areolæ are simply more or less separated regions of a single pulvinus, which appears in its simple form in *Opuntia*. The same observer also calls attention to the occurrence of true but minute leaves in *Cactus*, *Echinocactus*, and *Cereus*, structures which are prominent in *Opuntia*, and have been taken to be a distinguishing mark of that genus.

* *Scales of the ovary subulate, copiously woolly in the axils: fruit dry and enveloped in wool: spines (wanting in No. 7) rigid and annulate, not hooked.*—ERIOCARPI.

← *Ribs 10 to 27, acute.*

1. Echinocactus polycephalus Engelm. & Bigel.; Engelm. Syn. Cact. 276 (1856).

Globose (15 to 25 cm. in diameter) to ovate (25 to 40 cm. high, 12.5 to 25 cm. in diameter) and cylindrical (reaching 60 to 70 cm. high and about 25 cm. in diameter), profusely branched at base: ribs 13 to 21 (occasionally 10): spines 8 to 15, very stout and compressed, more or less recurved and reddish; radials 4 to 11, comparatively slender (the

[1] Morphologie und Biologie der Cacteen.

uppermost most so), 2.5 to 5 cm. long; the 4 centrals much stouter and longer (3 to 9 cm.), very unequal, the uppermost one usually the broadest and curved upward, the lowest one usually the longest and decurved: flowers yellow: fruit globose, 16 to 20 mm. in diameter: seeds irregularly angulate and minutely tuberculate, 4 mm. long. (*Ill.* Pacif. R. Rep. iv, t. 3, figs. 4–6)—Type, Bigelow of 1854 in Herb. Mo. Bot. Gard.

Stony and gravelly ground of the desert valleys in the southern part of the Great Basin, from southern Utah and southern Nevada through Arizona to southeastern California and Sonora.

Specimens examined: UTAH (*Palmer* of 1877; *Johnson* of 1877; *Siler* of 1883): ARIZONA (*Palmer* of 1870; *Bischoff* of 1871; *Nealley* of 1891): CALIFORNIA (*Bigelow* of 1854; *Clayton* with no number or date; *Wright* of 1882; *Coville & Funston* 153, Death Valley Exped.).

The plants are simple only when young, forming at maturity bunches of 20 to 30 (or even more) cylindric heads. Dr. Merriam speaks of this species as "resembling loose clusters of cocoanuts," and as commonly called "nigger-head" in the desert region.

2. Echinocactus polycephalus xeranthemoides, var. nov.
Echinocactus xeranthemoides Engelm. MSS.

Globose and smaller (2.5 to 12.5 cm. high): ribs 13, sharp and interrupted: spines about 12 (10 to 15), straight or slightly curved; radials smaller (about 3 cm.); the 4 centrals 3 to 5 cm. long, the lowest broadest and porrect from the center of the areola.—Type, Siler of 1881 and 1883 in Herb. Mo. Bot. Gard.

Extreme southwestern Utah and western Arizona, on the Kanab plateau and southward in the region of the Colorado.

Specimens examined: UTAH (*Siler* of 1883, "Kanab Mts."): ARIZONA (*Siler* of 1881, near the Colorado "on the Kanab wash;" *Rusby* 619, of 1883, at Peach Springs; *Evans* of 1891, between Gila Bend and Yuma).

Dr. Engelmann, having only the Siler specimens, regarded this as probably a new species, which view extreme forms might justify. However, more material makes it evident that it can not be more than a variety of *polycephalus*. The two forms belong together in the desert region of the Colorado, and both have the same profusely branching habit. The variety is much the smaller form, with usually more numerous spines, which are distinguished by the very prominent broad and porrect lower central, but there are intergrading forms which obscure this distinction.

3. Echinocactus parryi Engelm. Syn. Cact. 276 (1856).

Globose or depressed, becoming 20 to 30 cm. high and 25 to 40 cm. in diameter, simple: ribs 13, tuberculate-interrupted: spines stout, more or less compressed, white; radials 8 to 11, straight or a little curved, upper slenderer, lowest wanting; the 4 centrals a little stouter and longer (3.5 to 5 cm.), lowest longest and decurved: fruit oblong. (*Ill.* Cact. Mex. Bound. t. 32, figs. 6, 7)—Type probably lost. Dr. Englemann had but a few bunches of spines, the rest of the description being made up from Dr. Parry's notes, but I have failed to find these bunches of spines in the Engelmann collection.

Desert region of Chihuahua, "southwest of El Paso toward Lake Guzman, over an area of 60 or 80 miles in extent."

The species is clearly very near *E. polycephalus*, but should be distinguished from it readily by its simple habit and white spines.

4. Echinocactus texensis Hopf. Allg. Gart. Zeit. x, 297 (1842).
Echinocactus lindheimeri Engelm. Pl. Lindh. 246 (1845).

Mostly depressed (sometimes globose), 20 to 30 cm. in diameter, 10 to 15 cm. high, simple: ribs mostly 21 (sometimes 27, and in smaller specimens 13 or 14) and undulate: spines stout and fasciculate, reddish, compressed; the exterior 6 or 7 radiant, straightish or curved, unequal, 12 to 20 mm. long in some cases, 30 to 50 mm. in others, much shorter than the solitary and stout recurved central, which is sometimes 4 to 6 mm. broad: flowers about 5 cm. long, particolored (scarlet and orange below to white above): fruit subglobose, scarlet, 16 to 18 mm. in diameter: seeds reniform and compressed, black, smooth, and shining (or minutely pitted), 2.4 to 2.8 mm. long. (*Ill.* Cact. Mex. Bound. t. 33, figs. 1–6)—Type, Lindheimer 44 in Herb. Mo. Bot. Gard.

Common from the Colorado River of Texas to the Rio Grande, extending as far west as the Pecos, and southward into the northeastern states of Mexico.

Specimens examined: TEXAS (*Lindheimer* 44, and of 1850; *Wright* of 1848 and 1849; *Bigelow* of 1853; *Hall* 234; *Nealley* of 1891, near Del Rio): TAMAULIPAS (*Berlandier* 1836): NUEVO LEON (*Wislizenus* of 1847): COAHUILA (*Gregg* of 1847): MEXICO in general (*Poselger* of 1850): also specimens cultivated in St. Louis in 1864.

According to Labouret, this is *E. courantii* Lemaire, but I have had no means of verifying the statement.

+ + *Ribs 5 to 10, very broad and obtuse.*

5. Echinocactus horizonthalonius Lem. Cact. Gen. Nov. 19 (1839).
Echinocactus equitans Scheidw. Bull. Acad. Brux. vi, 88 (1839).
Echinocactus horizonthalonius centrispinus Engelm. Syn. Cact. 277 (1856).
Echinocactus laticostatus Engelm. & Bigel. Pacif. R. Rep. iv, 32 (1856).

Glaucous, depressed-globose or at length ovate or even cylindric with age, 4 to 20 cm. high, 6.5 to 15 cm. in diameter, simple: ribs 8 to 10 (fewer in very young specimens), often spirally arranged, the tubercles scarcely distinct by inconspicuous transverse grooves: spines 6 to 9, stout, compressed, reddish (at length ashy), recurved or sometimes almost straight, nearly equal, 2 to 4 cm. long (sometimes long and slender and almost terete, sometimes short, stout and broad); radials 5 to 8, upper ones weaker, lowest wanting; a single stouter decurved central (sometimes wanting): flowers pale-rose to purple, 6 cm. long or more: fruit red: seeds subglobose (usually looking shriveled and angular), rugose and minutely tuberculate, black, 2.5 to 3 mm. long. (*Ill.* Cact. Mex. Bound. t. 31 and 32, figs. 1–5)—Type unknown. The Wright and Wislizenus specimens in Herb. Mo. Bot. Gard. are types of *centrispinus* Engelm.

On stony ground, between the Pecos and Rio Grande in southwestern Texas and southern New Mexico, and extending southwest into Chihuahua, Coahuila, and San Luis Potosi.

Specimens examined: TEXAS (*Wright* of 1849, 1851, 1852; *Lemmon* of 1881; *G. R. Vasey* of 1881; *Evans* of 1891; *Nealley* of 1892): CHIHUAHUA (*Wislizenus* of 1846): COAHUILA (*Salm-Dyck* of 1857; *Palmer* 380, at Saltillo): SAN LUIS POTOSI (*Parry & Palmer* 272, of 1878.)

The distinction between *horizonthalonius* and *centrispinus* is an untenable one, being simply the presence or absence of the central spine. Dr. Engelmann had reached the same conclusion after examining a large amount of both living and dried material in European collections. I can not discover whether *horizonthalonius* of Lemaire or *equitans* of Scheidweiler has priority of publication. Both appeared in the same year, and hence I have retained the name in common use. Havard says that "this species, and perhaps others, under the name of 'bisagre' are sliced, candied in Mexican sugar, and kept in confectioneries."

6. **Echinocactus ingens** (Karw.) Zucc.; Pfeiff. Enum. 54 (1837).
Melocactus ingens Karw. ex Pfeiffer.
Echinocactus karwinskii Zucc. ex Labouret, not ex Pfeiffer.

Glaucescent, globose, or oblong, becoming 15 to 18 dm. high: ribs 8 (in small specimens, possibly more numerous in large ones), tuberculately interrupted and with broad sinuses: radial spines 8, reddish-brown, straight, rigid, and interwoven, 2.5 to 3.5 cm. long; central spine solitary and similar: flowers yellow, about 2.5 cm. long, and a little broader: fruit ovate, 3 cm. long: seeds reniform, black and shining, 4 mm. long.—Type unknown.

Coahuila and San Luis Potosi, to southern Mexico.

Specimens examined: COAHUILA (*Poselger*, without number or date): SAN LUIS POTOSI (*Parry & Palmer* 271; *Parry* of 1878; *Weber*): MEXICO, no State mentioned (*Palmer* of 1872).

The spine measurements are taken from small specimens. One of the largest of the genus.

7. **Echinocactus myriostigma** (Lem.) Salm, Cact. Hort. Dyck. ed. 1, 22 (1844).
Astrophytum myriostigma Lem. Cact. Gen. Nov. 4 (1839).
Cereus callicoche Gal.; Scheidw. Bull. Acad. Brux. vi, 88 (1839).

Depressed-globose, 12.5 cm. in diameter: ribs 5 or 6, very broad, covered with numerous somewhat pilose white spots, and with deep, obtuse sinuses: spines none: flowers large, pale-yellow. (*Ill.* Bot. Mag. t. 4177; Ill. Hort. t. 292)—Type unknown.

San Luis Potosi.

Specimens examined: SAN LUIS POTOSI (*Pringle* 3680): also specimens cultivated in Berlin in 1868, and at Cambridge (Mass.) in 1882.

I have been unable to discover whether the name of Galeotti or that of Lemaire has priority, as both were published in the same year. Sometimes called "bishop's hood."

* * *Scales of the ovary ovate, orbicular, or cordate, their axils almost naked: fruit scaly, never woolly.*—LEIOCARPI.

+ *Central spines flat, stout, and annulate, the lower one more or less recurved and sometimes hooked: ribs not tuberculately interrupted.*—CORNIGERI.

++ ***Spines similar** (all stout, reddish, and annulate).*

8. Echinocactus viridescens Nutt; Torr. & Gray, Fl. i, 554 (1840).

Globose or depressed, simple or branching at base, 10 to 30 cm. high, 15 to 25 cm. in diameter: ribs 13 to 21 (fewer when young), compressed and scarcely tuberculate: spines more or less curved and sometimes twisted, reddish below, shading into greenish or yellowish above; radials 9 to 20, 1 to 2 cm. long, the lowest shortest, and robust and decurved; centrals 4, cruciate, much stouter, compressed and 4-angled, 2 to 3.5 cm. long, the lowest broadest, longest, and straightest: flowers yellowish-green, about 4 cm. long: fruit ovate or subglobose, greenish, 16 to 20 mm. long: seeds obliquely obovate, 1.6 mm. long, very minutely but distinctly pitted. (*Ill.* Cact. Mex. Bound. t. 29)—Type unknown.

Dry hills and ridges near San Diego, California; also collected on the sea beach by Schott.

Specimens examined: CALIFORNIA (*Schott*, without date or number; *Parry* of 1850; *Newberry* of 1858; *Cooper* of 1862; *Agassiz* of 1872; *Pringle* of 1882: also plants cultivated in St. Louis and Washington).

The fruit is said to have the shape and taste of a gooseberry.

9. Echinocactus cylindraceus Engelm. Syn. Cact. 275 (1856).

Echinocactus viridescens cylindraceus Engelm. Amer. Journ. Sci. ser. 2, xiv, 328 (1852).

Globose to ovate or ovate-cylindrical, simple or branching at base, becoming as much as 9 dm. high and 3 dm. in diameter: ribs 13 in younger specimens, 20 to 27 in older ones, obtuse and tuberculate: spines stout, compressed, more or less curved, reddish; radials about 12, with 3 to 5 additional slender ones at upper edge of areola, 2.5 to 5 cm. long, the lowest stouter and shorter and much hooked; centrals 4, very stout and 4-angled, about 5 cm. long and 2 to 3 mm. broad, the uppermost broadest and almost straight and erect, the lowest decurved: flowers yellow: fruit subglobose, pale-greenish, about 2.5 cm. in diameter: seeds black, larger than in the last. (*Ill.* Cact. Mex. Bound. t. 30)—Type, Parry of 1850 in Herb. Mo. Bot. Gard.

From San Felipe, California (eastern slope of the mountains), into Lower California, and eastward to southern Utah, New Mexico, and southwestern Texas.

Specimens examined: CALIFORNIA (*Parry* of 1850; *Palmer* of 1870): LOWER CALIFORNIA (*Orcutt* of 1883): UTAH (*Palmer* of 1870): NEW MEXICO (*Parry*, without number or date): TEXAS (no collector named).

10. Echinocactus peninsulæ Engelm. MSS.

Globose to cylindrical, simple, 1.5 to 15 dm. high, 1.5 to 3.5 dm. in diameter, sometimes becoming as much as 25 dm. high: ribs about 21, straight or rarely oblique: spines red; radials about 11, robust, 2 to 3 cm. long, the upper longer; centrals 4, stouter, compressed and angled, 4 to 6 cm. long, the lowest longer (even 8 cm.), more robust, hooked downward: flowers from golden-yellow to red: fruit obovate.—Type, Gabb 11 in Herb. Mo. Bot. Gard.

Lower California, from Cape San Lucas to near San Diego.

Specimens examined: LOWER CALIFORNIA (*Gabb* 11 of 1867).

The larger forms occur in gravelly soil not far from the coast, at not over 200 to 300 feet elevation; the smaller ones (globose and about 15 cm. in diameter) more in the mountains and northward. Evidently near to *emoryi*, but becoming much taller and with more numerous and unequal radials and more numerous centrals.

11. Echinocactus emoryi Engelm. in Emory's Rep. 156 (1848).

Glaucescent, globose to ovate, 3 to 9 dm. high, 3 to 6 dm. in diameter: ribs 13 to 21, obtuse and strongly tuberculate: radial spines 7 to 9, nearly equal, stout, 2.5 to 5 cm. long, erect or a little recurved, reddish, darker toward the apex, at length ashy, the laterals a little longer; a solitary central porrect or at length recurved or somewhat hooked, a little longer and stouter; all with horny tips: flowers red and tipped with yellow (dark brownish-purple outside), about 7.5 cm. long: fruit oval, 2.5 to 4 cm. long: seeds black and pitted, 2 mm. long. (*Ill.* Cact. Mex. Bound. t. 28; Cact. Whippl. Exped. t. 3, fig. 3)—Type: the Emory specimen was not found in the Engelmann collection, but the specimens of Bigelow and Schott, included in the full description of Cact. Mex Bound., are in Herb. Mo. Bot. Gard.

From the valley of the Mojave (southeastern California) to the valley of the Gila (southwestern Arizona), and southward into Sonora; also on Cedros Island.

Specimens examined: CALIFORNIA (*Bigelow* of 1854): SONORA (*Schott* 3; *Palmer* of 1869; *Pringle* of 1884): also specimens cultivated in Hort. Pfersdorf.

In the original description of the Emory plant the fruit is said to be oval and 2.5 to 3.5 cm. long, with black and pitted seeds 2 mm. long, but in all later descriptions Dr. Engelmann says that the "fruit and seed are unknown," without any explanation as to the dropping of the original statement. The Pringle of 1884, however, abundantly confirms this character, showing a fruit as much as 4 cm. long.

12. Echinocactus emoryi rectispinus Engelm. MSS.

Globose, at length cylindrical, larger: radial spines very unequal, the 3 upper ones 10 to 12.5 cm. long, the lower 3.5 to 7.5 cm. long and paler; the central very long (30 to 32 cm.), straight or slightly decurved: flower and fruit unknown.—Type, Gabb 12 in Herb. Mo. Bot. Gard.

Lower California ("vicinity of Molije on the mountain sides 1,000 feet high") and Sonora.

Specimens examined: LOWER CALIFORNIA (*Gabb* 12, of 1867): SONORA (*Palmer* of 1869).

++ ++ *Spines dissimilar, at least the lateral radials white and setaceous and not annulate (sometimes wanting in Nos. 13 and 17).*

13. Echinocactus cornigerus DC. Rev. Cact. 36, t. 7 (1826).

Globose or depressed-globose, 25 to 40 cm. in diameter: ribs about 21, very acute and wavy (not tuberculately interrupted): radial spines 6 to 10, white and comparatively slender, or wanting; centrals red and very robust, angular-compressed, with long, sharp, horny tips, the

upper 3 erect-spreading, 2 to 3 cm. long, the lower 2 weaker and declined, the central one longer, more rigid and keeled, very broad (5 to 8 mm.) and hooked downward: flowers purple, 2.5 to 3.5 cm. long: fruit ovate: seed reniform, slightly pitted, 1.5 mm. long. (*Ill.* DC. *l. c.* t. 7; Mém. Cact. t. 10)—Type unknown.

In Mexico, from Nuevo Leon southward to Guatemala.

Specimens examined: SAN LUIS POTOSI (*Parry & Palmer* 270, 273; *Pringle* 3270; *Eschanzier* of 1891): NUEVO LEON (*Bourgeau* 1183): VERA CRUZ (*Weber* of 1865): State of MEXICO (*Poselger* of 1851): MEXICO, with no State assigned (*Mallinckrodt* 176).

A form with the lower central yellow and the flowers salmon is noted by Mrs. Anna B. Nickels.

14. Echinocactus wislizeni Engelm. Wisliz. Rep. 12 (1848).

At first globose, then ovate to cylindrical, 5 to 12 dm. high: ribs 21 to 25 (13 in small specimens), acute and oblique, more or less tuberculate: radial spines 1.5 to 5 cm. long, the 3 upper and 3 to 5 lower ones stiff, straight or curved, annulate, and red (in old specimens the 3 stout upper radials move toward the center and become surrounded by the upper bristly ones), the 12 to 20 laterals (sometimes additional shorter ones above) bristly, elongated, and flexuous, horizontally spreading, yellowish white; centrals 4, stout, angled, and red, 3.5 to 7.5 cm. long, the 3 upper straight, the lower one longest (sometimes as much as 10 to 12 cm.), very robust (flat and channeled above), and hooked downward: flowers yellow or sometimes red, 5 to 6.5 cm. long: fruit ovate, yellow, soon becoming hard: seeds obliquely obovate, black and rough, 2 to 2.5 mm. long. (*Ill.* Cact. Mex. Bound. t. 25, 26; Cact. Whippl. Exped. t. 3, figs. 1, 2)—Type, Wislizenus of 1846 in Herb. Mo. Bot. Gard.

From southern Utah, through eastern Arizona to the Rio Grande region about El Paso and southward into Chihuahua; also in Lower California.

Specimens examined: UTAH (*Bischoff* of 1871; *Siler* of 1875): ARIZONA (*Parry* of 1852; *Bischoff* of 1871; *Palmer* of 1873; *Rothrock* 492; *G. R. Vasey* of 1881, near Pantano; *Pringle* of 1882; *Rusby* of 1883; *Wilcox* of 1894, Fort Huachuca): NEW MEXICO (*Wislizenus* of 1846, near Doña Ana): TEXAS, region about El Paso (*Wright* of 1851; *Bigelow* of 1851, 1853; *Evans* of 1891): CHIHUAHUA (*Pringle* 211): LOWER CALIFORNIA (*Brandegee* of 1889, near San Franciscito).

Including its variety *lecontei*, the largest *Echinocactus* north of the Mexican boundary, and with its congeners known as the "barrel cactus." Young specimens may differ materially in spine characters.

15. Echinocactus wislizeni lecontei Engelm. Wheeler's Rep. 128 (1878).

Often somewhat taller (sometimes becoming 24 dm. high and 6 dm. in diameter), usually more slender, and at last clavate from a slender base: ribs somewhat more interrupted and more obtuse: lower central spine more flattened and broader, curved (rather than hooked) or

twisted, usually not at all hooked, sometimes as much as 15 cm. long: flower rather smaller. (*Ill.* Pacif. R. Rep. iv, t. 2, figs. 3–5; Cact. Mex. Bound. t. 27)—Type, LeConte 11 in Herb. Mo. Bot. Gard.

Rocky ground, from southwestern Utah and southern Nevada through western Arizona and adjacent California to Sonora and Lower California. Apparently not east of the Great Basin.

Specimens examined: UTAH (*Palmer* of 1877; *Siler*): ARIZONA (*LeConte* 11; *Bigelow* of 1854; *Newberry* of 1858; *Palmer* of 1867, 1869, 1874; *Parry* of 1881; *Pringle* of 1881; *Evans* of 1891): CALIFORNIA (*Parish* of 1880; *G. R. Vasey* of 1880): SONORA (*Palmer* of 1869): LOWER CALIFORNIA (*Brandegee* of 1889, at Boca de Las Animas, San Gregorio, and Posa de Los Dolores).

The Western representative of *E. wislizeni*, although the discovery of that form by Brandegee in Lower California indicates that the two are not geographically so distinct as was formerly supposed. In the Lower Californian specimens of *lecontei* the central spine (the prominent lower one) often becomes very broad and long and hooked, as in *cornigerus*. Among the Mexicans both *E. wislizeni* and *E. lecontei* have the reputation of being "traveler's plants," useful for allaying thirst, and the local name is variously reported as "biznaga," "bisnada," and "visnada."

16. Echinocactus wislizeni albispinus Toumey, Gard. & For. viii, 154 (1895).

Differs from *lecontei* in being oblong, and in the much fewer radials (11 in all, 2 upper and 3 to 5 lower rigid, and 2 or 3 laterals on each side flexuous), all of which (or only the flexuous ones) are whitish. (*Ill.* l. c.)—Type in Toumey Herb.

Southern Arizona and Lower California.

Specimens examined: ARIZONA (*J. W. Toumey* of 1892, near Tucson): LOWER CALIFORNIA (*M. E. Jones* of 1882.)

There can be no doubt but that this form with much fewer radial spines occurs throughout the range of *lecontei*, to which it is most closely allied. The radials are not merely reduced in number, but are remarkably diverse in character. In the Arizona specimens before me, the two upper radials are stout and annulate, colored like the centrals, but much smaller; then two flexuous laterals on each side are long and white; next the two remaining laterals on each side are rigid and red, and sometimes annulate; and the lowest spine is the shortest, slender, and almost flexuous. The large central, as in *lecontei*, has a curved horny tip (not a hooked one), and is broadly flattened above.

17. Echinocactus pilosus Gal.; Salm, Cact. Hort. Dyck. 148 (1850).
Echinocactus piliferus Lem.; Lab. Monogr. Cact. 186 (1858).

Globose, 15 to 45 cm. high: ribs 13 to 18, compressed, little if at all interrupted: radial spines represented by 3 slender ones at the lowest part of the pulvillus or wanting; centrals 6, very stout, at first purplish, then becoming pale-yellow, the 3 upper ones erect, the 3 lower recurved-spreading: flowers unknown, but probably like those of the variety.—Type unknown.

Coahuila and San Luis Potosi.

Specimens examined: COAHUILA (*Palmer* 375): SAN LUIS POTOSI (*Parry* 273; *Weber* of 1865, 1866): also specimens cultivated in Mo. Bot. Gard., 1883.

18. Echinocactus pilosus pringlei, var. nov.

Differs in that the radial spines are represented by 3 or 4 flexuous spines at upper edge of pulvinus and 4 or 5 at lower edge; centrals 6 or 7: flowers 3.5 to 4 cm. long, brownish-red.—Type, Pringle 154 in Herb. Gray.

Coahuila.

Specimens examined: COAHUILA (*Pringle* 154, distributed as *pilosus*).

+ + Spines dissimilar; radials subsetaceous; centrals angled or terete or sometimes flattish, generally at least one hooked at apex and often becoming much elongated.—HAMATI.

++ Central spines annulate.

19. Echinocactus hamatocanthus Muhlenpf. Allg. Gart. Zeit. xiv, 371 (1846).
Echinocactus longihamatus gracilispinus Engelm. Syn. Cact. 273 (1856).
Echinocactus hæmatochroanthus Hemsl. Biol. Centr. Amer. i, 532 (1886).

Subglobose or at length ovate, 1.5 to 6 dm. high (flowering often when not more than 5 cm. high): ribs 13 to 17, often oblique, broad, and obtuse, tuberculate-interrupted: spines 16 to 20, purplish or variegated when young, at length ashy; radials 12 to 14, spreading, straight, curved, or flexuous, the upper and lower ones 2.5 to 7.5 cm. long, the laterals 5 to 10 cm.; centrals 4 to 8, angulate compressed, the upper ones turned upwards, straight or curved or twisted, 5 to 12 cm. long, the lowest one stouter, elongated (7.5 to 16.5 cm.), hooked and often flexuous, porrect or deflexed: flowers 6.5 to 9 cm. long, yellow tinged with red (usually yellow within and red without): fruit ovate, green (?), 2.5 to 5 cm. long: seeds globose-obovate, 1.4 to 1.6 mm. long, pitted.—Type unknown.

From the Texan region of the "Great Bend" to the vicinity of Presidio del Norte and the mountains of the Limpia, but apparently not so far west as El Paso.

Specimens examined: TEXAS (*Wright* 223 of 1849, 764 of 1853; *Bigelow of* 1852).

Dr. Havard says that the ripe fruit is red, and "as delicious as that of the strawberry cactus." In this case, the "green" fruit of the collectors is simply the color of immaturity.

20. Echinocactus hamatocanthus longihamatus (Gal.).
Echinocactus longihamatus Gal.; Pfeiff. Abbild. ii, t. 16 (1843–50).
Echinocactus flexispinus Engelm. Wisliz. Rep. 27 (1848), not Salm (1850).
Echinocactus setispinus longihamatus Poselger, Allg. Gart. Zeit. xxi, 119 (1853).
Echinocactus longihamatus crassispinus Engelm. Syn. Cact. 273 (1856).

Spines much more robust; radials 8 to 11; centrals 4, angled, the lowest one flexuous and more or less hooked. (*Ill.* Cact. Mex. Bound. t. 21–24)—Type unknown.

From the "Great Bend" region of Texas southward through Chihuahua, Durango, Coahuila, and Nuevo Leon; said by Hemsley to occur in southern Mexico.

Specimens examined: TEXAS (*Nealley* of 1891; *Evans* of 1891): CHIHUAHUA (*Wislizenus* of 1847, type of *flexispinus* Engelm.): DURANGO

(*Gregg* 464): COAHUILA (*Palmer* 373, 374): NUEVO LEON (*Gregg* 197; *Pringle* 2237): also specimens cultivated in Harvard Bot. Gard., 1882; and in Mo. Bot. Gard., 1882.

21. Echinocactus hamatocanthus brevispinus (Engelm.).

Echinocactus longihamatus brevispinus Engelm. Syn. Cact. 274 (1856).

Spines more slender than in *longihamatus;* radials 8 to 11, 1 to 5 cm. long; centrals 4, terete, 3.5 to 5 cm. long, the lowest hooked and scarcely exceeding the radials.—Type unknown.

In the "Great Bend" region of Texas and westward to New Mexico.

Specimens examined: TEXAS (*Wright* of 1851): NEW MEXICO (*Nealley* of 1891).

These three forms of *hamatocanthus* simply express extreme variations, as there is the greatest variation in spine characters. The type is a Mexican one, crossing the Rio Grande at the "Great Bend," and reported as far west as El Paso in but a single case. From its occurrence in Chihuahua, however, all the forms may be expected in the El Paso region. Doubtless all the forms occur in Mexico, but I have seen *hamatocanthus* and *brevispinus* only from the Texan side of the Rio Grande.

++ ++ Central spines not annulate.

= One central spine (generally the upper one) elongated and mostly white.

22. Echinocactus uncinatus Gal.; Pfeiff. Abbild. ii, t. 18 (1843–50).

Glaucescent, globose to oblong: ribs 13, obtuse, tuberculate-interrupted: radial spines 7 or 8, 2.5 to 5 cm. long, the upper 4 or 5 straw-color, straight, flattened, the lower 3 purplish, terete, and hooked; centrals 4, the upper 3 rather stout and straight, about 2.5 cm. long, the lowest one very long, flattened, hooked at apex: flowers brownish-purple: fruit ovate, 1.5 to 2.5 cm. long: seeds much compressed, curved, smooth and shining, 1.2 to 1.4 mm. long. (*Ill.* l. c.; Cact. Mex. Bound. t. 74, fig. 9, seed)—Type unknown.

Chihuahua, Coahuila, and San Luis Potosi.

Specimens examined: COAHUILA (*Gregg* 617; *Poselger* of 1850): SAN LUIS POTOSI (*Gregg* 585): also specimens cultivated in Goebel's Gard. (St. Louis), 1845; and in Hort. Pfersdorf in 1869.

The usual reference of this name to Hopf. in Foerst. Handb. 321 (1846) is found to be a *nomen nudum*.

23. Echinocactus uncinatus wrightii Engelm. Syn. Cact. 272 (1856).

Oval, 7.5 to 15 cm. high, 5 to 8.5 cm. in diameter: radial spines 8, arranged as in the last; central spine solitary, angled, flexuous and hooked, elongated (5 to 15 cm.), erect, straw-color with dark tip: flowers 2.5 to 3.5 cm. long, dark-purple: fruit reddish: seeds curved, contracted at base, keeled on the back, tuberculate, 1.4 to 1.6 mm. long. (*Ill.* Cact. Mex. Bound. t. 74. fig. 10, seed)—Type, Wright and Bigelow specimens in Herb. Mo. Bot. Gard.

Abundant from El Paso, Texas, to the Pecos, but extending almost to the mouth of the Rio Grande, and southward into Chihuahua.

Specimens examined: TEXAS (*Wright* of 1849, 1851, 1852; *Bigelow* of 1852; *Nealley* of 1891, near Rio Grande City): CHIHUAHUA (*Pringle* 76).

Commonly in tufts of grass or hidden among low bushes, the long tuft of yellowish-white hooked central spines often difficult to distinguish from the surrounding bunches of dead grass.

24. Echinocactus polyancistrus Engelm. & Bigel.; Engelm. Syn. Cact. 272 (1856).

Ovate or at length subcylindric, becoming 10 to 25 cm. high and 7.5 to 10 cm. in diameter: ribs 13 to 17, obtuse, tuberculately interrupted: radial spines 20 or more, compressed and white, the uppermost wanting, the 4 upper ones broader and longer (2.5 to 5 cm.) and dusky-tipped, the laterals shorter (2 to 2.5 cm.), the lowest ones very short (1.2 cm.) and subsetaceous; central spines of several forms, the uppermost one (rarely a second similar but smaller one above or beside it) compressed-quadrangular, elongated (7.5 to 12.5 cm.), white with dusky tip, curved upward, the other 5 to 10 teretish or subangled, bright purple-brown, upper ones longer (5 to 9 cm.) and mostly straight, the others gradually shortening (to about 3 cm.) downward and sharply hooked: flowers red or yellow, 5 to 6 cm. long and wide: fruit pyriform, becoming almost destitute of scales: seeds large and tuberculate. (*Ill.* Pacif. R. Rep. iv, t. 2, figs. 1, 2)—Type, Bigelow of 1854 in Herb. Mo. Bot. Gard.

Gravelly hills and plains, from the Mohave desert region of southeastern California (headwaters of the Mohave) to the sage plains of western Nevada; apparently not abundant.

Specimens examined: CALIFORNIA (*Bigelow* of 1854; *Coville & Funston* 167, Death Valley Exped.): NEVADA (*Gabb* of 1867; *Shockley* 314).

The measurements of plant bodies and spines are taken from the larger southern forms of the Mohave desert. The Nevada plants are but 7.5 to 10 cm. high, with spines rarely more than 5 cm. long, the radials but 1 to 2.5 cm. Said to resemble a pineapple in general size and appearance. The number of hooked spines varies from 3 to 7 according to age and development. In the original description as given in the "Cactaceæ" of Whipple's Expedition the flower characters are drawn from immature buds. Shockley's Nevada specimens are in full flower and show the lower half of the ovary to be naked, a few small rounded fimbriate sepals above, those of the limb few, larger and petal-like; petals 10, about 3 cm. long, spatulate, entire, slightly mucronate-tipped.

25. Echinocactus whipplei Engelm. & Bigel.; Engelm. Syn. Cact. 272 (1856).

Globose-ovate, 7.5 to 12.5 cm. high, 5 to 10 cm. in diameter: ribs 13 to 15 (often oblique), compressed and tuberculately interrupted: radial spines usually 7, compressed, straight or slightly recurved, 12 to 18 mm. long, lower ones shorter than the others, all white excepting the two darker lowest laterals; central spines 4, widely divergent, the uppermost one flattened, straight and white, 2.5 to 4 cm. long (1 to 2.5 mm. broad at base), turned upward in the plane of the radials (completing the circle of radials), the others a little shorter (2.5 to 3 cm.), quadrangular-compressed, dark-brown or black becoming reddish and finally ashy, the 2 laterals straight, the lowest one stouter and sharply hooked downward: flower greenish-red, 2 to 3 cm. long: ovary with few (2 to 5) scales: seeds

large (3.2 to 3.4 mm. long), black and minutely tuberculate. (*Ill.* Pacif. R. Rep. iv, t. 1)—Type, Bigelow of 1853 in Herb. Mo. Bot Gard.

Sandy soil, often half buried, valley of the Lower Colorado and Little Colorado, northern Arizona.

Specimens examined: ARIZONA (*Bigelow* of 1853; *Newberry* of 1858; *Brandegee* of 1875).

26. Echinocactus whipplei spinosior Engelm. Trans. St. Louis Acad. ii, 199 (1863).

Globose, 7.5 cm. in diameter: ribs 13: radial spines 9 to 11, 12 to 36 mm. long, the lower ones often dusky, the 2 upper ones often elongated, flattened and curved; the 4 centrals 3.5 to 5 cm. long, the uppermost one flexuous and white, the other 3 a little shorter, dusky, all or only the lowest one hooked: flowers about 2.5 cm. long: fruit oval, 12 mm. long.—Type, H. Engelmann of 1858 in Herb. Mo. Bot. Gard.

In Desert Valley, west of Sevier Lake, Utah, and abundant in southwestern Colorado.

Specimens examined: UTAH (*H. Engelmann* of 1858): COLORADO (*Brandegee* of 1875, La Plata Valley and Mesa Verde).

So far as known, *E. whipplei* is confined to the region of its original discovery (valley of the Little Colorado, northern Arizona), and *spinosior* to the deserts of southern Utah and southwestern Colorado, a considerable distance to the north. Intergrading forms may be found in the intermediate region, but until they are, the northern and southern forms seem abundantly distinct.

= = Central spines similar and none of them specially elongated.

a. Ribs obtuse: flowers small (2.5 to 3 cm. long).

27. Echinocactus brevihamatus Engelm. Syn. Cact. 271 (1856).

Globose-ovate, from a turbinate fibrous root, very dark green: ribs 13, deeply tuberculate-interrupted, the tubercles with a woolly groove extending to the base, where it expands into the flower-bearing areola: radial spines mostly 12, terete, straight, white or yellowish with dusky tips, 10 to 20 mm. long, the upper the longer; central spines 4 (rarely 1 or 2 additional ones), flattened, white with black tips, the 2 lateral ones divergent upward, straight or a little recurved, exceeding the radials, 28 to 44 mm. long, the uppermost one weaker, 16 to 20 mm. long, the lowest stoutest and darkest, porrect or deflexed, hooked downward, 18 to 20 mm. long: flowers funnelform, 24 to 32 mm. long and 18 to 20 mm. wide when fully expanded, rose-color: fruit and seed unknown. (*Ill.* Cact. Mex. Bound. t. 18, 19)—Type, Wright and Bigelow specimens in Herb. Mo. Bot. Gard.

From Eagle Pass and the San Pedro River, Texas, southward into Coahuila and Nuevo Leon.

Specimens examined: TEXAS (*Bigelow* of 1852, 1853; *Wright* 86): NUEVO LEON (*Palmer* 1080).

The strong tubercles with the axillary flower-bearing areola connected with the spine-bearing areola by a woolly groove is such a striking Coryphanth character that it suggests a much closer relationship than the present position would imply.

It still further emphasizes the fact that the generic lines in *Cactaceæ* are of very uncertain definition.

28. Echinocactus scheerii Salm, Cact. Hort. Dyck. 155 (1850).

Globose or ovate, 3.5 to 5 cm. in diameter, from a long terete root: ribs 13, deeply tuberculate-interrupted, the tubercles ovate and grooved half way down: radial spines 15 to 18 (or 11 to 13 in younger specimens), strictly radiant, 6 to 12 mm. long, about equal, setaceous and rigid, straight or a little recurved, white or straw-color with dark apex, the uppermost sometimes elongated; central spines 3 or 4, angled, brownish-black and white variegated, the upper ones straight, divergent upward, 12 to 24 mm. long, the lowest one shorter, porrect and hooked: flowers greenish-yellow, about 2.5 cm. long, much less in diameter: fruit small, green, almost naked: seeds large (about 2 mm. long), brown and minutely tuberculate. (*Ill.* Cact. Mex. Bound. t. 17)—Type unknown.

In the region about Eagle Pass, on the Rio Grande, Texas, and southward into northern Mexico.

Specimens examined: TEXAS (*Poselger* 5 of 1850; *Schott* of 1854): MEXICO, no State recorded (*Weber* of 1866).

This species is also suggestive of a very close alliance with *Cactus*. The prominent tubercles are not arranged in very evident ribs, and the woolly groove extending half way down the tubercle is suggestive of *Cactus macromeris*. The relationship becomes still more emphasized if the seeds accompanying the Poselger specimens, from which the seed description is drawn, be really those of *scheerii*. They are the only brown seeds I know in *Echinocactus*, and the cotyledons are much smaller than is usual in the genus.

b. Ribs acute: flowers large (4 to 7.5 cm. long).

29. Echinocactus pubispinus Engelm. Trans. St. Louis Acad. ii, 199 (1863).

Small, turbinate, oval, 5 cm. high, 2.5 to 3 cm. in diameter: ribs 13, somewhat oblique, compressed and tuberculate-interrupted: spines velvety-pubescent, at length naked, white with dusky apex; radial spines 5 or 6 below, 9 to 12 above, 2 to 8 mm. long, the upper 1 or 2 stouter and longer, straight or curved or hooked; central spine wanting, or occasionally a single stouter, longer (10 to 12 mm.) one, erect and always strongly hooked: flowers and fruit unknown.—Type, H. Engelmann of 1859 in Herb. Mo. Bot. Gard.

Pleasant Valley, near Salt Lake Desert, Utah.

Specimens examined: UTAH (*H. Engelmann* of 1859).

The species seems never to have been rediscovered.

30. Echinocactus sinuatus Dietr. Allg. Gart. Zeit. xix, 345 (1851).
Echinocactus setispinus sinuatus Poselger, Allg. Gart. Zeit. xxi, 119 (1853).
Echinocactus setispinus robustus Poselger, *l. c.*
Echinocactus treculianus Lab. Monogr. Cact. 202 (1858).

Globose, 10 to 20 cm. in diameter, bright-green: ribs 13, oblique, acute, and tuberculate-interrupted, the tubercles shortly grooved: radial spines 8 to 12, setiform and flexible, the 3 upper and 3 lower purplish-

brown and straightish (the lower ones sometimes more or less hooked), 2 to 2.5 cm. long, the 2 to 6 laterals more slender, longer (2.5 to 3.5 cm.), often flattened, puberulent and whitish, sometimes flexuous or hooked; central spines 4, puberulent, yellowish (or purplish-variegated), the 3 upper ones slender, flattened or subangled, erect and generally straight (rarely hooked), 4 to 5 cm. long, the lowest one much stouter, flattened or even channelled, straw-color, flexuous, more or less hooked (sometimes straight), 5 to 10 cm. long: flowers yellow, 5 to 7.5 cm. long: fruit oval, green, 16 to 18 mm. long: seeds obovate or lenticular, shining and minutely punctate, 0.8 to 1.2 mm. long. (*Ill.* Cact. Mex. Bound. t. 74, figs. 11–14, seeds)—Type unknown, but probably Poselger of 1850 in Herb. Mo. Bot. Gard.

From the Rio Grande, near Eagle Pass, and the San Pedro and Pecos, Texas, westward to Arizona (near Comstock) and southward into Coahuila.

Specimens examined: TEXAS (*Wright* of 1852, on the Limpia, also 2, 223, 639): ARIZONA (*Nealley* of 1891, near Comstock): COAHUILA (*Poselger* of 1850).

31. Echinocactus setispinus Engelm. Pl. Lindh. i, 246 (1845).
Echinocactus setispinus setaceus Engelm. Pl. Lindh. ii, 201 (1850).

Subglobose, 5 to 7.5 cm. in diameter: ribs 13, more or less oblique, often undulate or somewhat interrupted: radial spines 14 to 16, setiform and flexible, 10 to 20 mm. long, the uppermost (the longest) and lowest ones yellowish-brown, the laterals white; central spines 1 to 3, setiform and flexuous, dark, 24 to 32 mm. long: flowers funnelform, 4 to 7 cm. long, yellow, scarlet within: fruit globose, fleshy and red, about 8 mm. in diameter: seeds globose-obovate and oblique, strongly tuberculate, 1.2 to 1.6 mm. long. (*Ill.* Cact. Mex. Bound. t. 20, in part)—Type, Lindheimer of 1844 in Herb. Mo. Bot. Gard.

From the Brazos River, Texas, to the Rio Grande and southward into Tamaulipas. In mesquit thickets, etc.

Specimens examined: TEXAS (*Lindheimer* of 1844, 1859; *Wright* of 1848, 1850; *Hall* 234): TAMAULIPAS ("St. Louis Volunteers" of 1846): also specimens cultivated at St. Louis in 1845, presumably from the type.

This smaller form, which happened to be described first, is the eastern lowland representative of the next, extending from the lowlands of southeastern Texas to those of northeastern Mexico.

32. Echinocactus setispinus muhlenpfordtii (Fen.).
Echinocactus muhlenpfordtii Fen. Allg. Gart. Zeit. xv, 65 (1847).
Echinocactus hamatus Muhlenpf. Allg. Gart. Zeit. xvi, 18 (1848).
Echinocactus setispinus hamatus Engelm. Pl. Lindh. ii, 201 (1850).

Ovate-globose to oblong-cylindrical, larger, becoming 10 to 20 cm. high: radial spines fewer (10 to 12), stouter, larger (12 to 32 mm.); central spine stouter, 24 to 32 mm. long, hooked: otherwise as the last. (*Ill.* Cact. Mex. Bound. t. 20, in part)—Type unknown.

Extending from San Antonio, Texas, westward to the region of Eagle Pass and El Paso and southward into Coahuila and Chihuahua.

Specimens examined: TEXAS (*Lindheimer* of 1846, near San Antonio; *Schott* of 1852, at Eagle Pass; *Bigelow* of 1852, 1854, at Eagle Pass; *Evans* of 1891, near El Paso; *Neally* of 1891, near Camp Hudson): also specimens cultivated in St. Louis in 1846, 1847, 1849, 1855, 1859.

The two forms of this well known species seem worthy of separation. Although there is much intergrading where the two ranges overlap, the extreme eastern and northern forms seem almost specifically distinct from those of the extreme west.

+ + + Spines never hooked.

++ Ribs very numerous, crowded, acutely compressed, and wavy: upper (usually radial) spine broad, thin and flat, the others teretish.

33. Echinocactus phyllacanthus Mart.; Otto & Dietr. Allg. Gart. Zeit. iv, 201 (1836).

From globose to cylindrical, with depressed vertex, simple or proliferous, 6 to 8.5 cm. broad: ribs 40 to 55 (sometimes as few as 30), very much crowded and compressed, thin, acute, and very wavy, continuous or somewhat interrupted: radial spines 5 (sometimes 6 or 7), straight and spreading, the 2 lowest ones white, rigid, 4 to 6 mm. long, half as long as the 2 darker, angled, larger laterals, the uppermost spine thin and broad (3 mm.), channeled above, faintly annulate, flexible, grayish-pink, 15 to 25 mm. long; central spines none: flowers small, dirty white: fruit unknown.—Type unknown.

San Luis Potosi, to southern Mexico.

Specimens examined: SAN LUIS POTOSI (*Parry & Palmer* 269; *Eschanzier* of 1891): also specimens cultivated in Hort. Jacoby in 1857, and in Mo. Bot. Gard. in 1879.

The specific name refers to the thin and broad flexible "leaf-like" upper spine.

34. Echinocactus lancifer Dietr. Allg. Gart. Zeit. vii, 154 (1839).

Depressed, globose, 6 cm. in diameter, simple: ribs about 40, crowded and thin, very acute and wavy, scarcely interrupted: spines straw-color or very pale yellow; radials 7, the 4 lower ones short (5 to 6 mm.), rigid and recurved, the remaining ones annulate, angled, bulbous at base, the 2 laterals reflexed-spreading, 3 cm. long, shorter than but similar to the solitary annulate central spine (which is often flattened toward the apex), and half as long as the broad, thin, and scarcely rigid uppermost radial, which is channeled above: flowers deep rose-color: fruit unknown.—Type unknown.

San Luis Potosi.

Specimens examined: SAN LUIS POTOSI (*Eschanzier* of 1891).

35. Echinocactus spinosus Wegener, Allg. Gart. Zeit. xii, 66 (1844).
Echinocactus wippermanni Muhlenpf. Allg. Gart. Zeit. xiv, 370 (1846).
Echinocactus acifer Hopf. ex Foerst. Handb. Cact. 520 (1846).

Depressed-globose, 6 cm. in diameter, simple, densely woolly on the younger areolæ: ribs 36 to 40, oblique, crowded, thin and acute, very

wavy and tuberculate-interrupted: radial spines 14 to 22, setaceous and white, more or less rigid, 12 to 14 mm. long (upper much shorter), radiantly interwoven with those of adjacent clusters and densely covering the whole plant; central spines usually 4 (occasionally 1 to 3), grayish with dusky tips, faintly annulate, the lateral ones concave above, slightly longer than the terete lower one (which is sometimes wanting) and usually twice as long as the thin flat upper one: flowers and fruit unknown.—Type unknown.

San Luis Potosi.

Specimens examined: SAN LUIS POTOSI (*Eschanzier* of 1891).

Two forms appear in the Eschanzier collection: one with about 20 radials and 4 centrals, of which the laterals are twice as long as the upper; the other with 14 radials and 3 centrals (the lowest one wanting), of which the laterals are not twice as long as the upper. In the original *wippermanni* the radials are 18 to 22, and the centrals 1 to 3.

36. Echinocactus coptonogonus major Salm, Cact. Hort. Dyck. 156 (1850).

Depressed, from a large indurated naked napiform base, 10 to 15 cm. across the top: ribs 10 to 15, acute from a broad base, more or less transversely interrupted and sinuous: spines 3, annulate, very stout and erect from deeply sunken areolæ, reddish when young, becoming ashy gray; upper spine stoutest, erect and straight, or slightly curved upward, flattened and keeled, and occasionally twisted, 4 to 5.5 cm. long, the two laterals erect-divergent, straight, or slightly curved, terete above and somewhat quadrangular below, 2 to 3 cm. long; all from an abruptly enlarged base: flowers not seen, but said to be small and white, with purplish median lines.—Type unknown.

San Luis Potosi to southern Mexico.

Specimens examined: SAN LUIS POTOSI (*Eschanzier* of 1891): also specimen growing in Mo. Bot. Gard., 1893.

The flat top of the plant seems covered with the stout, erect and interlocking sword-like spines, the central (and uppermost) one of each cluster of three being much the largest and rising perpendicularly. The spines rise from such deep-seated areolæ that the acute rib below each areola projects between the two lateral spines like a blunt tooth. *E. coptonogonus* differs from the variety in its much smaller spines, which are five in number, the two lowest being very small and deflexed.

++ ++ *Ribs tuberculate-interrupted: spines dissimilar* (*one or more compressed*).

37. Echinocactus hystrichacanthus Lem. Cact. Gen. Nov. 17 (1839).

Globose-conical, very stout, 6 dm. or more in diameter: ribs acute, repand and crenate: spines reddish-brown with golden tips, annulate; radials 8 to 10, radiant, unequal, subterete; centrals 4, the lowest porrect, angular and very long: flowers and fruit unknown.—Type unknown.

From Coahuila to Vera Cruz.

Specimens examined: COAHUILA (*Thurber* of 1853; *Poselger* of 1855): VERA CRUZ (*Poselger* of 1851): also specimens cultivated in Hort. Bot. Berol. in 1869.

38. Echinocactus bicolor Gal.; Pfeiff. Abbild. Cact. ii, t. 25 (1843–50).
Echinocactus bicolor pottsii Salm, Cact. Hort. Dyck. 173 (1850).
Echinocactus pottsii Scheer; Seem. Bot. Herald, 291 (1852–57), not Salm.

Globose-ovate, stout, 3.5 to 10 cm. in diameter, sometimes becoming 20 cm. high: ribs 8, oblique and obtuse, compressed: lower radial spines and centrals variegated red and white; radials 9 to 17, spreading and recurved, slender and rather rigid, the lowest one shortest (1.5 to 2 cm.), the laterals longer (2 to 4 cm.), about equaling the 2 to 4 flat flexuous ashy upper ones; centrals 4, flat and flexuous, 3 to 6 cm. long, the uppermost thin and not longer than the erect and rigid laterals, the lowest very stout, porrect and very long: flowers funnelform, purple, 5 to 7.5 cm. long: fruit unknown. (*Ill.* l. c.)—Type unknown.

Chihuahua, Coahuila, and San Luis Potosi.

Specimens examined: CHIHUAHUA (*Wislizenus* of 1846; *Potts* of 1850; *Evans* of 1891): COAHUILA (*Palmer* 379): SAN LUIS POTOSI (*Palmer* of 1879; *Eschanzier* of 1891): "Northern Mexico" (*Poselger*): also specimens cultivated in Mo. Bot. Gard., 1881, and in Harvard Bot. Gard., 1882.

The radial spines usually number 9 to 11, but the Chihuahua specimens of Evans show 14 to 17, thus resembling *schottii*. The chief distinctive character between the two is found in the relative development of the centrals, in *bicolor* the lowest, in *schottii* the uppermost being the most prominent. In the former, also, the uppermost central is not only not more prominent than the laterals, but it is flat; while in the latter it is not only the most prominent but is carinate below.

39. Echinocactus bicolor schottii Engelm. Syn. Cact. 277 (1856).

Ovate or ovate-cylindric, 10 to 15 cm. high, 5 to 7.5 cm. in diameter: radial spines 15 to 17, straight; uppermost central broadest and longest (3 to 4 cm.), flat above and keeled below, straight or a little curved, the 3 others compressed or subterete, shorter and straight.—Type, Schott of 1853 in Herb. Mo. Bot. Gard.

"On cretaceous hills covered with chaparral," from near Mier on the Lower Rio Grande, Texas, to San Luis Potosi.

Specimens examined: TEXAS (*Schott* of 1853): SAN LUIS POTOSI (*Palmer* of 1882).

40. Echinocactus orcuttii Engelm. West Amer. Sci. ii, 46 (1886).

Cylindrical, 6 to 10.5 dm. high, 3 dm. in diameter, single or in clusters up to 18 or more, not rarely decumbent: ribs 18 to 22, often oblique: spines extremely variable, angled to flat, 1 to 7 mm. wide; radials 11 to 13, unequal, lowest and several laterals thinnest; centrals 4: flowers about 4 cm. long, deep-crimson in center bordered by light greenish-yellow: fruit globose and green, about 16 mm. in diameter: seeds (unripe) brown, tuberculate, 1.8 mm. long. (*Ill.* W. Amer. Sci. ii, 47)—Type, Orcutt of 1883 in Herb. Mo. Bot. Gard.

"Palm Valley, Lower California, 30 to 50 miles southeast of San Diego."

Specimens examined: LOWER CALIFORNIA (*C. R. Orcutt* of 1883).

41. Echinocactus limitus Engelm. MSS.

Globose and large, 3 dm. or more in diameter: ribs 21, oblique, thick and broad (compressed above), slightly interrupted: radial spines 12 to 16, about 2.5 cm. long, upper and lower most prominent, laterals occasionally somewhat twisted; central spines 4, ashy-red, finely annulate, slightly recurved, upper and lower ones flat and broad, 4 to 4.5 cm. long, lateral ones angular and shorter: flowers campanulate, purplish-brown or dusky, 3.5 to 4 cm. long and broad: fruit green.—Type, Hitchcock of 1876 in Herb. Mo. Bot. Gard.

Along the "boundary line south of San Diego, with *Agave shawii* and *Cereus emoryi*."

Specimens examined: Boundary line between California and Lower California (*G. M. Hitchcock* of 1876): also specimens cultivated at Shaw's Garden in 1876.

++ ++ ++ *Ribs deeply sulcate or tuberculate: spines similar (all flat or all terete) and interwoven with those of adjacent clusters (except in No. 49).*

= *Tubercles more or less confluent at base: flowers reddish (unless in No. 47).*

42. Echinocactus johnsoni Parry, Bot. King Surv. 117 (1871).

Oval, 10 to 15 cm. high: ribs 17 to 21, low, rounded, tuberculately interrupted, close-set, often oblique, densely covered with stoutish reddish-gray spines: radial spines 10 to 14, 1.5 to 3 cm. long, the upper longest; centrals 4, stouter, recurved, 3.5 to 4 cm. long: flowers 5 to 6.5 cm. long and wide, from deep-red to pink: seeds reticulate-pitted.—Type, Johnson of 1870 in Herb. Mo. Bot. Gard.

Near St. George, Washington County, extreme southwestern Utah, and extending into southern Nevada (about Vegas Wash, *fide* Coville), and doubtless into adjacent California (Inyo County).

Specimens examined: UTAH (*Johnson* of 1870, 1874; *Parry* of 1870; *Palmer* of 1877).

Dr. Merriam says that this species is "eaten by the Paiute Indians, who peel it as we would a cucumber."

43. Echinocactus johnsoni octocentrus, var. nov.

Central spines 8, strongly bulbous at base, the upper half red, recurved-spreading, 2.5 to 3 cm. long: flowers 3 cm. long and wide, pink.—Type, Coville & Funston 278 in Nat. Herb.

Rusting Springs Mountains, Inyo County, California.

Specimens examined: CALIFORNIA (*Coville & Funston* 278 of 1891).

This variety seems to represent the extreme western form of the species.

44. Echinocactus unguispinus Engelm. Wisliz. Rep. 27 (1848).

Depressed-globose, 10 cm. in diameter, 7.5 cm. high: ribs 21, tuberculate-interrupted: radial spines about 21, slender, white, recurved, interwoven with those of adjacent clusters, the lower ones 12 to 20 mm. long, the upper ones 24 to 30 mm. long; central spines 5 (rarely 6), stouter, longer, horny, turned upward, the upper ones 24 to 36 mm. long, the lowest one very stout, brown-tipped, curved downward,

20 to 24 mm. long: flowers (from shrivelled specimens) about 2.5 cm. long and probably pale-red: fruit unknown. (*Ill.* Cact. Mex. Bound. t. 35, figs. 6–8)—Type, Wislizenus of 1847 in Herb. Mo. Bot. Gard.

Chihuahua, about Pelayo.

Specimens examined: CHIHUAHUA (*Wislizenus* of 1847).

"The large recurved spines, especially the stoutest central one, which is of a bluish horn-color, with a brown point, and is curved and bent downward like a large fang, cover the whole surface of the plant, and give it a very pretty appearance." The fruit and seed characters of the original description were taken from fruits collected by Dr. Gregg about San Lorenzo (Chihuahua), which Dr. Engelmann at the time did not doubt belonged to this species, but which afterwards proved to belong to *E. uncinatus*. The prominent tubercles have the woolly groove characteristic of Coryphanths. This species has been referred to *intertextus*, but is probably distinct.

45. Echinocactus intertextus Engelm. Syn. Cact. 277 (1856).

Ovate-globose, 2.5 to 10 cm. high: ribs 13, acute, somewhat oblique, tuberculate-interrupted, the tubercles with a woolly grove: spine short and rigid, reddish from a whitish base and with dusky tips; radials 16 to 25, closely appressed and interwoven, the upper 5 to 9 setaceous and white, straight, 5 to 12 mm. long, the laterals more rigid and a little longer (8 to 14 mm.), the lowest stout and short (4 to 8 mm.), a little recurved; centrals 4, the 3 upper ones turned upward and exceeding the radials and interwoven with them (10 to 18 mm. long), the lower one very short (2 to 4 mm.), stout and porrect: flowers about 2.5 cm. long and wide, purplish: fruit globose, dry, about 8 mm. in diameter: seeds reniform, slightly rough and shining, about 2 mm. long. (*Ill.* Cact. Mex. Bound. t. 34)—Type, specimens of Wislizenus and Wright in Herb. Mo. Bot. Gard.

From the Pecos River, Texas, westward to El Paso and southward into Chihuahua.

Specimens examined: TEXAS (*Wright* of 1851, 1852; *Engelmann*): CHIHUAHUA (*Wislizenus* of 1846).

46. Echinocactus intertextus dasyacanthus Engelm. Syn. Cact. 277 (1856).

Ovate or conical, becoming 15 cm. high: spines slender, longer, more ashy; radials 19 to 25, setaceous and in many series, 12 to 16 mm. long, the 7 to 9 upper ones more slender, shorter, whitish, and fascicled; centrals scarcely stouter, 18 to 22 mm. long, the upper 3 exceeding the rest, the lowest one porrect and but little shorter. (*Ill.* Cact. Mex. Bound. t. 35, figs. 1–5)—Type, specimens of Wright in Herb. Mo. Bot. Gard.

From the region about El Paso, Texas, and contiguous New Mexico, southward into Chihuahua and San Luis Potosi.

Specimens examined: TEXAS (*Lindheimer* of 1844; *Wright* of 1851, 1852; *Engelmann*; *Lemmon* of 1881): NEW MEXICO (*Evans* of 1891, at Rincon; *Neally* of 1891): CHIHUAHUA (*Evans* of 1891, at Juarez): SAN LUIS POTOSI (*Eschanzier* of 1891).

Very closely resembles *Cactus dasyacanthus* and might be mistaken for it.

47. Echinocactus erectocentrus, sp. nov.

Broadly ovate and simple, with very flat base, 8 cm. high: ribs 21, oblique, tuberculate-interrupted: spines terete, rigid, interwoven; radials 14, pectinate-appressed below, spreading above, bulbous at base, 10 to 12 mm. long, the 4 or 5 lower ones shorter, with white base and pink tips; the solitary central from the upper part of the areola, longer (20 mm.), erect and slightly curved, darker: flowers yellow (?): fruit unknown.—Type in Nat. Herb. and Herb. Coulter.

Near Benson, Arizona, and also near Saltillo, Coahuila.

Specimens examined: ARIZONA (*Evans* of 1891): COAHUILA (*Weber* of 1869).

The plant is characterized by its very flat base, on which the spines are persistent even to the origin of the root, and by uniformly erect centrals. It is nearly related to *E. horripilus* Lem., to which the Webber plant has been referred, but judging by descriptions of that species, no such reference can be made on account of its much smaller spines, more numerous radials, strictly erect centrals, and always simple habit. It seems so unlikely that this species would be found at such widely-separated stations as Benson, Arizona, and Saltillo, Coahuila, that there must be a suspicion of shifted labels on the part of one of these collectors. Mr. Evans's only Mexican collections are from Chihuahua, just across the Rio Grande from El Paso, and it is barely possible that this plant should bear a Chihuahua label, but this is only suggested by the location of the Webber station.

=== *Tubercles distinct (as in* Cactus): *flowers yellowish or whitish (in No. 50 some times shading to purple).*

48. Echinocactus sileri Engelm. MSS.

Globose: ribs 13, prominent, densely crowded, with short rhomic-angled tubercles: radial spines 11 to 13, white; central 3, black with pale base, 18 mm. long, the upper one slightly longer: flowers scarcely 2.5 cm. long, straw-colored: fruit unknown.—Type, Siler of 1883 in Herb. Mo. Bot. Gard.

Cottonwood Springs and Pipe Springs, southern Utah.

Specimens examined: UTAH (*A. L. Siler* of 1883).

49. Echinocactus papyracanthus Engelm. Trans. St. Louis Acad. ii, 202 (1863).
Mamillaria papyracantha Engelm. Pl. Fendl. 49 (1849).

Ovate, about 5 cm. high and 3.5 cm. in diameter, proliferous: ribs 8, oblique, completely broken up into tubercles, of which the lower ones are proliferous: all the spines flat, chartaceous, flexible, and silky-white; radials 8, short (3 to 4 mm.), all directed laterally or downwards; centrals 3 or 4, much longer, the 2 or 3 upper ones curved upwards, 12 to 18 mm. long, the single lower one longer (20 to 28 mm.) and broader (2 to 2.5 mm.), turned downwards: flowers 2.4 to 2.6 cm. long and slightly broader, pearly white: fruit unknown.—Type, Fendler 279 of 1847 in Herb. Mo. Bot. Gard.

"In a valley between the lower hills," near Santa Fe, New Mexico, "in loose red sandy though fertile soil."

Specimens examined: NEW MEXICO (*Fendler* 279 of 1847; *Bandelier* of 1882).

Collected but once by Fendler, and 35 years later, near the same station, by Bandelier; reported by Marcus E. Jones in *Zoe*, iii, 301 as "scarce everywhere," but with no further statement as to station. "Spines silky-white, shining, of the constituency of stiff paper." The generic relationship as yet rests only on the fact that the floral and spiniferous areolæ join at the apex of the young tubercles; otherwise the whole appearance of the plant is that of a *Cactus*.

50. Echinocactus simpsoni, Engelm. Trans. St. Louis Acad. ii, 197 (1863).

Subglobose or depressed, turbinate at base, simple, often clustered, 7.5 to 12.5 cm. in diameter: ribs 8 to 13, only indicated by the spiral arrangement of the prominent tubercles, which are 12 to 16 mm. long, somewhat quadrangular at base and cylindric above: exterior spines 20 to 30, slender, rigid, straight, whitish, 8 to 12 mm. long, with 2 to 5 additional short setaceous ones above; interior spines 8 to 10, stouter, yellowish and reddish brown or black above, erect-spreading, 10 to 14 mm. long; no truly central spine: flowers 16 to 20 mm. long and nearly as broad, yellowish-green to pale-purple: fruit green and dry, 6 to 7 mm. long and almost as broad: seeds black, obliquely obovate, tuberculate, 3 mm. long. (*Ill.* Cact. Simpson's Exped. t. 1, 2.)—Type, H. Engelmann of 1859 in Herb. Mo. Bot. Gard.

In high mountain valleys and on rocky ridges, from the eastern slope of the Rocky Mountains of Colorado westward through Utah and into the mountains of Nevada.

Specimens examined: COLORADO (*Parry* of 1860, 1862; *Hall & Harbour* of 1862; unnamed collector in 1871; *Greene* 131; *Palmer* of 1877; *Martindale* of 1878; *Patterson* 211): UTAH (*H. Engelmann* of 1859; *G. Engelmann* of 1874; *Johnson* of 1883).

51. Echinocactus simpsoni minor Engelm. Trans. St. Louis Acad. ii, 197 (1863).

The whole plant, tubercles, spines, flowers, and seeds smaller.—Type, Hall & Harbour of 1862 in Herb. Mo. Bot. Gard.

Mountains of Colorado.

Specimens examined: COLORADO (*Hall & Harbour* of 1862; *Wolf & Rothrock* 54 of 1873; *H. Engelmann* of 1874).

52. Echinocactus simpsoni robustior, var. nov.

Larger in every way: tubercles much larger: exterior spines 16 to 20, 18 to 23 mm. long; interior spines about 10, 20 to 28 mm. long.—Type, Watson of 1868 in Herb. Mo. Bot. Gard.

From the Humboldt Mountains of Nevada, northward to Washington (?).

Specimens examined: NEVADA (*Watson* of 1868): WASHINGTON (*Brandegee* 793; *Tweedy* of 1882).

While the specimens of Brandegee and Tweedy seem referable to this form, the occurrence of an *Echinocactus* so far north calls for a more careful inquiry as to the really indigenous character of the material.

A peculiar monstrosity of *E. simpsoni* and its varieties is that which is styled "snake cactus" or "brain cactus." So far as it has come to my observation it is found among the mountains of Colorado, and is a modification of *E. minor*. It con-

sists of a hemispherical mass 15 cm. or more in diameter, with brain-like convolutions formed by the winding of a single ridge, bearing no resemblance to the normal plant. It is usually proliferous about the border, and I have seen develop from it the normal forms. There are also all intermediate forms between this and the type form. There occurs also a cone-like form of this monstrosity 10 to 11 cm. high, found in the same region, but apparently developed from regular *simpsoni*. I have seen, also, the same "brain" form assumed by *Cactus niveus aristatus* in specimens cultivated in Mo. Bot. Gard. It is very probable that this curious habit is far more general among *Cacti* and *Echinocacti* than shown by this record.

ECHINOCACTUS CALIFORNICUS Monville, Cat. (1846), was described from seedlings whose identity and native country are so very uncertain that no further statement can be made concerning them.

ARTIFICIAL KEY TO THE SPECIES.

The following key, based upon spine characters, may be useful in case of incomplete material. Forms found within the boundaries of the United States are printed in italics. The species and varieties are indicated only by their specific or varietal names, and the numbers refer to the serial numbers of the synoptical presentation.

* *Some of the spines hooked.*

\- *Central spines none.*

pubispinus (29).

\-\- *Central spine solitary.*

Spines annulate.

emoryi (11).

Spines not annulate.

Some radials and the central hooked.

wrightii (23), *pubispinus* (29).

Only the central hooked.

muhlenpfordtii (32).

\-\-\- *Central spines 4.*

\+\+ *Some or all of the spines annulate.*

Radials 8 to 11.

All the spines annulate.

peninsulæ (10).

Only the centrals annulate.

longihamatus (20), *brevispinus* (21).

Radials 12 to 14.

cylindraceus (9), *hamatocanthus* (19).

Radials 18 to 28.

wislizeni (14).

\+\+ \+\+ *None of the spines annulate.*

Radials 7 or 8.

Only a central hooked.

whipplei (25).

Some radials and a central hooked.

uncinatus (22), *sinuatus* (30).

Radials 9 to 11.

spinosior (26), *scheerii* (28), *sinuatus* (30).

Radials 12 to 18.

brevihamatus (27), *scheerii* (28), *sinuatus* (30).

+ + + + Central spines 5 to 8.

Radials 6 to 10: centrals annulate.
cornigerus (13).
Radials 12 to 14: centrals annulate.
hamatocanthus (19).
Radials 20: no annulate spines.
polyancistrus (24).

** * None of the spines hooked.*

+ Central spines none.

Ribs 8 to 10, broad.
horizonthalonius (5).
Ribs 40 to 55, very thin and wavy.
phyllacanthus (33).

+ + Central spines solitary.

Radials 5 to 9.
Ribs 8 to 10, broad.
horizonthalonius (5), ingens (6).
Ribs 13 to 21.
texensis (4), *emoryi* (11), rectispinus (12).
Ribs 40, very thin and wavy.
lancifer (34).
Radials 14 to 22.
Ribs 13.
setispinus (31).
Ribs 21.
erectocentrus (47).
Ribs 36 to 40.
spinosus (35).

+ + + Central spines 2 or 3.

Radials none: ribs 10 to 15.
major (36).
Radials 8: ribs 8.
papyracanthus (49).
Radials 11 to 13: ribs 13.
sileri (48).
Radials 14 to 16: ribs 13.
setispinus (31).

+ + + + Central spines 4.

Ribs 8.
Radials 8 to 10.
hystrichacanthus (37), bicolor (38), *papyracanthus* (49).
Radials 11 to 17.
bicolor (38), *schottii* (39).
Ribs 13 to 21.
Spines all rigid and annulate.
polycephalus (1), *xeranthemoides* (2), parryi (3), *viridescens* (8).
At least some of the radials setaceous or bristly.
leeontei (15), jonesii (16).
Spines dissimilar (one or more flattened).
orcuttii (40), *limitus* (41).
Spines similar (all flat or all terete), closely interwoven.
johnsoni (42), *intertextus* (45), *dasyacanthus* (46).
Ribs 36 to 40.
spinosus (35).

+ + + + + *Central spines 5 to 7.*

Radials 3.
pilosus (17).
Radials 7 to 9.
pringlei (18).
Radials 21.
unguispinus (44).

+ + + + + + *Central spines 8 to 10.*

Radials 10 to 14.
octocentrus (43).
Radials 16 to 30.
simpsoni (50), *minor* (51), *robustior* (52).

* * * *Spines entirely wanting.*

myriostigma (7).

GEOGRAPHICAL DISTRIBUTION.

The genus *Echinocactus* has a strong development within the United States, but has no such northern extension as *Cactus*, its extreme northern limit being in the southern borders of Colorado, Utah, and Nevada, unless we except the possible occurrence of *E. simpsoni robustior* in Washington. With more careful exploration, especially of the Great Basin region, other forms will be discovered, but as recognized in this revision, 36 are known within our borders, 15 of which are restricted to the United States. Owing to the insufficiency of knowledge no statement can be made concerning the distribution of Mexican forms, and nothing very satisfactory concerning those occurring within the United States.

No *Echinocactus* has such an east and west distribution along our borders as have some species of the genus *Cactus*, the only one approaching any such distribution being *cylindraceus*, which seems to be a Lower Californian form that has extended from southeastern California to southern Utah and southwestern Texas, although it may have an equally wide Mexican distribution. All the other species seem to have extended northward along comparatively narrow lines, and indicate in a general way their Mexican origin. Other Lower Californian forms which extend within our boundaries are: *peninsulæ*, which only reaches the southern borders of California; and *emoryi* and *lecontei*, which are also Sonoran, the former ranging northward in the lower basin of the Colorado (extreme southeastern California and adjacent southwestern Arizona), the latter extending farther northward to southern Nevada and southern Utah. The occurrence of forms in Lower California which seem best referred to *wislizeni* is somewhat puzzling, as otherwise that species has been found restricted to a much more eastern distribution, one of Chihuahuan origin. The only pure Sonoran form that reaches us, so far as recorded, is *polycephalus*, which extends northward through the lower basin of the Colorado to southern Nevada and southern Utah, an extension resembling that of *lecontei*. Types from Chihuahua and Coahuila have extended into Texas, usually ranging

eastward throughout its southern borders; *horizonthalonius*, *intertextus*, and *dasyacanthus* are confined to the very usual narrow northern extension between the Pecos in Texas and the Upper Rio Grande in New Mexico; *longihamatus*, *brevihamatus*, and *scheerii* are forms which belong to the region of the "Great Bend" of the Rio Grande; while *wrightii*, *muhlenpfordtii*, and *texensis* are found throughout the southern border of the State, the first extending from El Paso to the mouth of the Rio Grande, the second from El Paso to San Antonio, the third from the Pecos to the Colorado of Texas. The last three species, doubtless, have an equally wide east and west Mexican distribution. In opposition to this usually eastern extension of Chihuahuan and Coahuilan forms, the three following extend westward from the Pecos-El Paso region into Arizona, the first reaching southern Utah: *wislizeni*, *sinuatus*, and *erectocentrus*. From the low country of eastern Mexico *setispinus* and *schottii* reach the basin of the Lower Rio Grande, the former extending as far northward as the Brazos.

The fifteen forms said to be restricted to the United States doubtless include some that are Mexican, and the statements here made are simply based upon the present record. Naturally the region of highest northern extension shows the greatest number of these peculiar forms, and such extension has evidently been most favored by the conditions of the Colorado basin, Nevada, Utah, and Colorado, having been reached through this avenue. The most prominent northern type is *simpsoni* and its varieties *minor* and *robustior*, the species ranging through Colorado, Utah, and Nevada, *minor* being restricted to Colorado and *robustior* to Nevada, with a possible high northern extension. In the region comprising the southwestern corner of Colorado, southern Utah, southern Nevada, northern Arizona, and adjacent California, we find the largest display of forms that do not seem to have Mexican representation. In addition to the three already mentioned, there are *xeranthemoides*, *polyancistrus*, *whipplei*, *spinosior*, *pubispinus*, *johnsoni*, *octocentrus*, and *sileri*, making eleven of our fifteen forms. Of the remaining four, *hamatocanthus* and *brevispinus* belong to the "Great Bend" region of Texas; *viridescens* is a form of extreme southern California, and the peculiar *papyracanthus*, restricted so far as known to New Mexico in the neighborhood of Santa Fé. The species *orcuttii* and *limitus* are as yet recorded only from the boundary between California and Lower Calfornia; but doubtless they with *viridescens* will be found to have a Lower Californian distribution.

5. CEREUS Mill. Gard. Dict. ed. 8 (1768).

Plants of various habit (globose to cylindrical, trailing, climbing, or erect), sometimes very large, with spine-bearing ribs: flower-bearing areolæ close above fully developed spine-bearing areolæ: ovary bearing scales which are naked or woolly and often spiny in the axils: fruit succulent: seeds almost without endosperm: embryo mostly hooked,

with short or foliaceous cotyledons.—*Echinopsis* Zucc. (1837); *Cephalocereus* Pfeiff. (1838); *Cephalophorus* Lem. (1838); *Pilocereus* Lem. (1839); *Echinonyctanthus* Lem. (1839); *Echinocereus* Engelm. (1848); *Cleistocactus* Lem. (1861).

It is often perplexing to distinguish between the low forms of *Cereus* and *Echinocactus* in the absence of complete material. But the fact that the flowers of *Echinocactus* are developed just above the nascent spine-bearing areolæ, and those of *Cereus* just above the fully matured bunches of spines, results in making the flowers of the one terminal and of the other lateral. Even in the absence of flowers it is very seldom that the position and age of flower-bearing areolæ can not be easily determined.

Our information with regard to the large species of *Cereus*, even those which are of economic value throughout Mexico, is very scanty. In 1869 Dr. Engelmann visited Dr. Weber in Paris, who had collected *Cacti* extensively in central and southern Mexico, and had made a large accumulation of notes. These notes are now to be found among those of Dr. Engelmann, and although often incomplete, and even incoherent in the characterization of species, I have ventured to include them.

I. ECHINOCEREUS. ***Stems oval or cylindrical: seeds tuberculate: embryo straight.***

* ***Stems oval: ribs numerous (10 to 21): spines numerous (12 to 30), pectinate.***

\+ ***Flowers green: central spines 1 to 3 cm. long; radials not crowded.***

1. **Cereus viridiflorus** Engelm. Pl. Fendl. 50 (1849).
Echinocereus viridiflorus Engelm. Wisliz. Rep. 7 (1848).

Subglobose, simple or sparingly branched, 2.5 to 7.5 cm. high: ribs 13, acute, scarcely interrupted: radial spines 12 to 18 (with 2 to 6 setaceous upper ones), straight and strictly radiant, 2 to 6 mm. long, laterals longest and reddish brown, the rest white (rarely purple); central none or a single stout, straight or curved spine (rarely a second more slender one) 12 to 14 mm. long, variegated purple and white: flowers 2.5 cm. long and wide, greenish-brown outside, yellowish-green within; petals obtuse: fruit elliptical and greenish, 10 to 12 mm. long: seeds 1 to 1.2 mm. long, tuberculate.—Type, Wislizenus 514 of 1846 in Herb. Mo. Bot. Gard.

From the Laramie Mountains of southern Wyoming, southward through Colorado to eastern New Mexico and the high plains of northwestern Texas. The most northern *Cereus*.

Specimens examined: WYOMING (*Hayden* of 1856, at base of Laramie Mts.): COLORADO (*Hall & Harbour* 69 of 1861; *Scoville* of 1869; *Greene* 132; *Martindale* of 1879; *Jones* 103): NEW MEXICO (*Fendler* 278; *Wright*, near Santa Fé; *Evans* of 1891): TEXAS (*Wislizenus* 514 of 1846; *Wright* of 1849; *Bigelow* of 1853): also specimens cultivated in Mo. Bot. Gard. in 1861; and growing in same garden in 1892 and 1893.

This and the following variety are exceedingly variable as to color of radial spines and presence of one or two centrals. Some clusters of spines may be all red, others all white, others variegated; and in the spring the bright purple and white spines are far more showy than the inconspicuous greenish flowers, the lines of color often

occurring in bands about the plant. In the Evans specimen, from Brewster County, New Mexico, the ribs are 14, the radial spines as many as 20, and the centrals 3 or 4, a form which was also seen among the plants cultivated in the Missouri Botanical Garden.

2. Cereus viridiflorus tubulosus, nom. nov.

Cereus viridiflorus cylindricus Engelm. Syn. Cact. 278 (1856), not *C. cylindricus* Haw.

Larger and becoming cylindrical, 7.5 to 20 cm. high and 2.5 to 5 cm in diameter: spines 4 to 12 mm. long; the central (when present) longer (12 to 20 mm.) and stouter: petals acute. (*Ill.* Cact. Mex. Bound. t 36)—Type, Wright of 1851 in Herb. Mo. Bot. Gard.

Southwestern Texas, from the Pecos to the region about El Paso.

Specimens examined: TEXAS (*Wright* of 1851; *Evans* of 1891): also numerous specimens in cultivation.

3. Cereus chloranthus Engelm. Syn. Cact. 278 (1856).

Cylindrical, simple or sparingly branching at base, 7.5 to 25 cm. high, 3.5 to 5 cm. in diameter: ribs 13 to 18, somewhat interrupted: radial spines 12 to 20, laxly radiant and pectinate, setiform and white, 4 to 10 mm. long, the lower laterals longest (8 to 10 mm.) and often purplish at apex, upper ones shortest, 5 to 10 additional shorter setaceous ones above; centrals 3 to 6 (none in young plants), the two upper shorter (12 mm), divergent upward and mostly purplish, the 1 to 3 lower ones longer (18 to 30 mm.), divergent and deflexed, white: flowers 2.5 cm. long, yellowish-green, always low down on the plant (usually below the middle): fruit subglobose, 1.2 cm. in diameter or less, spiny: seeds orbicular and compressed, 1.0 to 1.2 mm. in diameter, confluent-tuberculate. (*Ill.* Cact. Mex. Bound. t. 37 and 38)—Type, Wright and Bigelow specimens in Herb. Mo. Bot. Gard.

Common on stony hills about El Paso, Texas, and in adjacent New Mexico.

Specimens examined: TEXAS (*Wright* of 1851 and 1852; *Bigelow* of 1852; *G. R. Vasey* of 1881, El Paso; *Le Conte* 12; *Briggs* of 1892; *Trelease* of 1892): NEW MEXICO (*Evans* of 1891: *Nealley* of 1891): also growing in Missouri Botanic Garden in 1892 and 1893.

+ + Flowers yellow: central spines 5 to 6 mm. long: radials crowded.

4. Cereus dasyacanthus Engelm. Pl. Fendl. 50 (1849).

Echinocereus dasyacanthus Engelm. Wisliz. Rep. 16 (1848).

Ovate or subcylindric, 12.5 to 30 cm. high, 5 to 10 cm. in diameter, simple or sparingly branched at base, subcespitose: ribs 15 to 21, straight or oblique, somewhat interrupted, with crowded areolæ: spines 20 to 30, straight, rigid, stellately spreading, porrect in every direction and interlocked, ashy-gray or reddish (white in weaker plants); radials 16 to 24, laterals longest (12 to 14 mm.) and somewhat bulbous at base, upper shorter (6 to 8 mm.) and slender, lower about 10 mm. long and

stoutest; centrals 3 to 8, stouter, deflexed or porrect in every direction: flowers near the vertex, 7.5 cm. or more long, yellow: fruit subglobose and spiny, green or greenish-purple, 2.5 to 3.5 cm. in diameter: seeds subglobose, 1.2 long, strongly tuberculate. (*Ill.* Cact. Mex. Bound. t. 39, 40, 41, f. 1 and 2)—Type, Wislizenus of 1846 in Herb. Mo. Bot. Gard.

Common about El Paso, Texas, thence down to the canyon of the Rio Grande, and west into Arizona.

Specimens examined: TEXAS (*Wislizenus* of 1846; *Wright* of 1849, 1850, 1851, 1852, and 1857; *Bigelow* of 1852; *Miller* of 1881; *G. R. Vasey* of 1881, El Paso; *Evans* of 1891; *Trelease* of 1892): ARIZONA (*Lemmon* of 1881; *Wilcox* of 1894, Ft. Huachuca): also growing in Missouri Botanical Garden in 1892 and 1893.

The whole plant is densely covered by the innumerable ashy-gray or reddish spines. When fully ripe the fruit is said to be "delicious to eat, much like a gooseberry."

5. Cereus dasyacanthus neo-mexicanus, var. nov.

Differs in the remote areolæ (1 to 1.5 cm. apart), fewer spines (11 radials and 4 centrals), which are much stouter, 10 to 12 mm. long, radiating, scarcely (if at all) pectinate, and larger seed (1.5 mm. in diameter).—Type, Wright 366 in Herb. Mo. Bot. Gard.

Southeastern New Mexico.

Specimens examined: NEW MEXICO (*Wright* 366).

6. Cereus ctenoides Engelm. Cact. Mex. Bound. 31 (1859).

Ovate, subsimple, 5 to 10 cm. high, 3.5 to 6.5 cm. in diameter: ribs 15 or 16, usually oblique and somewhat interrupted, with crowded areolæ (2 mm. apart): spines rigid and interlocked, with bulbous base, whitish and at length ashy, 2 to 8 mm. long; radials 14 to 22, pectinate, laterally compressed and often recurved, lowest 2 to 4 mm., lateral 6 to 8 mm., uppermost 1 to 2 mm. long; centrals 2 or 3 (rarely 4), stout, in one longitudinal series, 2 to 6 mm. long: flowers 5.5 to 8 cm. long and broad, bright-yellow with a light-green center: ovary spiny. (*Ill.* l. c. t. 42)—Type, the Wright and Bigelow material in Herb. Mo. Bot. Gard.

From Eagle Pass, Texas, to the Pecos, and southward into Coahuila and Chihuahua.

Specimens examined: TEXAS (*Bigelow* of 1853, at Eagle Pass; *Wright*, at the Pecos): COAHUILA (*Bigelow* of 1853, about Santa Rosa): CHIHUAHUA (*Pringle* 254 of 1885, distributed as *dasyacanthus*.)

A specimen, probably from Oracle, Arizona (*Evans* of 1891), seems to belong with these forms, but is hardly referable to any of them. It is simple or proliferous, ovate-cylindrical, 10 to 20 cm. high, with 16 tuberculate ribs, red-tipped spines, 10 to 12 radials 6 to 10 mm. long (the upper much shorter), mostly 3 darker-red centrals, the lower one stouter and slightly deflexed equaling the radials, the 2 upper usually much shorter. It is possibly a form of *ctenoides*, but the centrals are not in one longitudinal series. There is some uncertainty also as to its station, so that this possible western extension of *ctenoides* can not be affirmed.

+++ *Flowers red: radial spines crowded.*

++ *Central spines very short* (*longer in* radians) *or none.*

7. Cereus cæspitosus Engelm. Pl. Lindh. 247 (1845).
Echinocereus cæspitosus Engelm. Wisliz. Rep. 26 (1848).
Cereus concolor Schott, Engelm. Pacif. R. Rep. iv, errata and notes, ii (1856).
Cereus cæspitosus minor and *major* Engelm. Syn. Cact. 280 (1856).

Ovate-globose to ovate-cylindrical, usually 2.5 to 5 cm. in height and diameter (rarely as much as 12.5 to 15 cm. high and 5 to 9 cm. in diameter), cespitose (often 5 to 12 heads) or sometimes almost or quite simple: ribs 12 or 13, straight, with confluent tubercles and approximate areolæ: spines white (sometimes rosy or brown), somewhat or not at all interlocked; radials 20 to 30, pectinate, straight or subrecurved, the upper and lower shorter, the lateral longer (4 to 8 mm.); centrals none, or rarely 1 or 2 very short ones: flowers rose-purple, 5 to 7.5 cm. long and broad, the tube with numerous extra-axillary pulvini bearing brown or black bristles: fruit green, ovate, 18 to 20 mm. long: seed obliquely obovate, strongly tuberculate, black, 1.2 to 1.4 mm. long, sometimes almost globose. (*Ill.* Cact. Mex. Bound. t. 43 and 44)—Type, Lindheimer 402 of 1845 in Herb. Mo. Bot. Gard.

From the Canadian and Arkansas rivers, in Indian Territory, southward through Texas east of the Pecos, and into the states of Mexico east of Chihuahua. Apparently the most eastern *Cereus*, with a western limit near the 100th meridian.

Specimens examined: TEXAS (*Lindheimer* 402 of 1845 and 1851; *Wright* of 1849 and 1850; *Smith* of 1856; *Hall* 235; *Miss Soulard* of 1883): COAHUILA (Mo. Bot. Gard. of 1890): SAN LUIS POTOSI (*Eschanzier* of 1891): also cultivated in Harvard Botanic Garden in 1846 and 1849; and in Missouri Botanic Garden in 1845 and 1846.

This species is said by Prince Salm to be cultivated in Europe under the name *Echinopsis reichenbachiana*, and to be confused with *pectinatus*. The Eschanzier material from San Luis Potosi often has 3 central spines, but *cæspitosus* is distinguished from its allies by having several lower spines much shorter and weaker than the laterals.

8. Cereus cæspitosus castaneus Engelm. Pl. Lindh. 203 (1850).

Differs in having chestnut-brown or reddish spines.—Type, Lindheimer of 1847 in Herb. Mo. Bot. Gard.

Southeastern Colorado to eastern Texas.

Specimens examined: TEXAS (*Lindheimer* of 1847 and 1852; *Hall* 235 of 1875, near Austin; *Trelease* of 1892): COLORADO (*Brandegee* of 1875): also cultivated in Harvard Botanic Garden in 1882.

9. Cereus pectinatus (Scheidw.) Engelm. Pl. Fendl. 50 (1849).
Echinocactus pectinatus Scheidw. Bull. Brux. v, 492 (1838).
Echinocactus pectiniferus Lem. Cact. Nov. 25 (1838).
Echinocereus pectinatus Engelm. Wisliz. Rep. 25 (1848).
Cereus pectiniferus Lab. Mon. Cact. 320 (1858).

Ovate-cylindrical, simple, 17 to 18 cm. high: ribs 18 to 23, tuberculate-interrupted, with approximate areolæ: radial spines 16 to 20, subrecurved, appressed-pectinate, white with rosy tip, upper and lower

shorter (4 mm.), lateral longer (8 mm.); centrals 2 to 5 (mostly 3), in a single longitudinal series, very short (1 to 2 mm): flowers purple, 7.5 cm. long and broad, with red or purple spiny bristles on tube: fruit ovate-globose, spiny: seed tuberculate. (*Ill.* Hook. Bot. Mag. t. 4190)—Type unknown.

Chihuahua, Coahuila, and southward.

Specimens examined: CHIHUAHUA (*Wislizenus* of 1847): COAHUILA (*Palmer* of 1880): NUEVO LEON (*Poselger* of 1850 and 1855).

It has been suggested that this is identical with its northern representative *cæspitosus;* but *pectinatus* is always a larger plant, generally much larger, is always simple, has more numerous ribs, fewer radial spines, and constant centrals.

10. Cereus pectinatus rigidissimus Engelm. Syn. Cact. 279 (1856).

Plant 10 to 20 cm. high, 5 cm. in diameter: ribs 20 to 22: radial spines 15 to 22, subulate from a bulbous base, very stout and rigid, variegated white, yellow, or reddish, interlocking, upper 3 to 6 setaceous, laterals 12 to 16 (6 to 9 mm. long), lowest one scarcely shorter (4 mm.); centrals none.—Type, Schott 6 in Herb. Mo. Bot. Gard.

From southwestern Texas west to Arizona and southward into Chihuahua and Sonora.

Specimens examined: TEXAS (*Nealley* of 1891; *Trelease* of 1892): ARIZONA (*G. R. Vasey* of 1881, Pantana; *Lemmon* of 1882, Huachuca Mts.; *Pringle* of 1884, distributed as *pectinatus; Palmer* 447 and 475 of 1890, Ft. Huachuca, the latter distributed as *cæspitosus*, and the former accompanied by seeds of *Echinocactus intertextus; J. W. Toumey* of 1892; *T. E. Wilcox* of 1894, Ft. Huachuca): CHIHUAHUA (*Wislizenus* 257 of 1847): SONORA (*Schott* 6): also growing in Mo. Bot. Gard. 1893.

Distinguished by the greater stoutness and rigidity of its radial spines and by the absence of centrals. Mr. Schott, who collected it in Sonora, in the Sierras of Pimeria Alta and westward, says that the local name is "cabeza del viejo." Apparently a very common form in southern Arizona. The spines are very variable in coloration. The plant always appears parti-colored, a pink and white, or red and yellow and white, or even a dark red with areas of dark brown, or even jet black. Some of the forms look very much like *cæspitosus*, but the habit is different, and that species ranges much further east. Besides, *pectinatus rigidissimus* has stout radials, much interlocking with each other on the same rib, and with those of adjoining ribs. Pringle's Arizona specimens have remarkably long radials, the laterals reaching 15 mm., and the lowest 10 mm.

11. Cereus pectinatus centralis, var. nov.

Plant 6 to 8 cm. high: centrals usually 4, the lowest very short (3 to 4 mm.) and porrect, the upper two or three as long as the radials (sometimes longer), and recurved upward.—Type, Wilcox of 1894 in Nat. Herb.

Arizona, near Fort Huachuca.

Specimens examined: ARIZONA (*T. E. Wilcox* of 1894).

In a casual examination the short porrect central looks as if it were solitary. The variety *spinosus* has one long solitary central, and *centralis* seems to carry the same tendency further. It may be a good species. The centrals are not in a single vertical row, as usual in *pectinatus*, but are more after the pattern of *dasyacanthus*, but otherwise unlike that species.

12. Cereus pectinatus spinosus, nom. nov.

Cereus pectinatus armatus Poselger, Allg. Gart. Zeit. xxi, 134 (1853), not *Cereus armatus* Otto.

Ribs 15 or 16: radial spines 16 to 20; central solitary and longer than the radials.—Type unknown.

Near Monterey, Nuevo Leon.

13. Cereus adustus Engelm. Pl. Fendl. 50 (1849).

Echinocereus adustus Engelm. Wisliz. Rep. 20 (1848).

Ovate, 4 to 10 cm. high, 2.5 to 5 cm. in diameter: ribs 13 to 15, with oval approximate areolæ: radial spines 16 to 20, appressed, white with dark tip, the 4 or 5 upper short (2 mm.) and setaceous, the lateral and lower longer (8 to 10 mm. and 4 mm.) and stouter; centrals none: flower and fruit unknown.—Type, Wislizenus of 1846, in Herb. Mo. Bot. Gard.

In the mountains of Chihuahua, in "Cosihuiriachi."

Specimens examined: CHIHUAHUA (*Wislizenus* of 1846 in part).

This species is distinguished from its allies by its fewer ribs, broader areolæ, lowest spines much as in *pectinatus*, and no centrals.

14. Cereus adustus radians (Engelm.).

Echinocereus radians Engelm. Wisliz. Rep. 20 (1848).

Upper radials 2 to 4 mm. long, lateral 10 mm., lower 6 mm.; central solitary, much stouter, porrect, brown or black, 2.5 cm. long.—Type, Wislizenus of 1846 in Herb. Mo. Bot. Gard.

In the mountains of Chihuahua, in "Cosihuiriachi."

Specimens examined: CHIHUAHUA (*Wislizenus* of 1846 in part).

++ ++ *Central spines 8 to 50 mm. long.*

15. Cereus roetteri Engelm. Cact. Mex. Bound. 33 (1859).

Cereus dasyacanthus minor Engelm. Syn. Cact. 279 (1856).

Ovate-cylindrical, 12.5 to 15 cm. high: ribs 10 to 13, tuberculately interrupted, with areolæ 8 to 12 mm. apart: spines subulate from a bulbous base, reddish with dark tip, at length ashy, 8 to 16 mm. long; radials 8 to 15 (often setaceous ones added above), lateral longer (lower 10 to 16 mm., upper 4 to 6 mm.), lowest spine shorter; centrals 2 to 5, stouter, often somewhat shorter, usually 8 to 12 mm. long (rarely one longer): flowers purplish-red, 6 to 7.5 cm. long: fruit subglobose, 16 to 20 mm. long: seed obliquely obovate, strongly and irregularly tuberculate, 1.4 mm. long. (*Ill.* Cact. Mex. Bound. t. 41, f. 3–5)—Type, Wright of 1851 and 1852 and Bigelow of 1852 in Herb. Mo. Bot. Gard.

From the region about El Paso, Texas, southward into Chihuahua and westward into Arizona.

Specimens examined: TEXAS (*Wright* of 1851 and 1852; *Briggs* of 1892): ARIZONA (*Lemmon* of 1881): CHIHUAHUA (*Bigelow* of 1852).

16. Cereus rufispinus Engelm. Pl. Fendl. 50 (1849).

Echinocereus rufispinus Engelm. Wisliz. Rep. 20 (1848).

Ovate-cylindrical, 10 cm. high and 5.5 cm. in dameter: ribs 11, with approximate areolæ: radial spines 16 to 18, interlocked and at length

appressed, 3 to 5 upper setaceous, short (2 to 4 mm.), white, lateral elongated (14 to 18 mm.), recurved and reddish, lower 8 mm. long; central solitary, much stouter, reddish and porrect, 2.5 cm. long: flowers red, with tube over 5 cm. long: fruit unknown.—Type, Wislizenus of 1846 in Herb. Mo. Bot. Gard.

In the mountains of Chihuahua, "Cosihuiriachi, mountains west of Chihuahua."

Specimens examined: CHIHUAHUA (*Wislizenus* of 1846).

17. Cereus longisetus Engelm. Syn. Cact. 280 (1856).

Ovate-cylindrical, subsimple, 15 to 22.5 cm. long and 5 to 7.5 cm. in diameter: ribs 11 to 14, distinctly tuberculate: spines setaceous, white, flexible and spreading; radials 18 to 20, straight, lower (10 to 14 mm. long) much longer than the upper (5 to 6 mm.) which are also more slender; centrals 5 to 7, the upper hardly longer than the radials, the 3 lower elongated (2.5 to 5.5 cm.), divaricate, often flexuose and deflexed: flowers said to be red: fruit unknown. (*Ill.* Cact. Mex. Bound. t. 45)—Type, Bigelow of 1853 in Herb. Mo. Bot. Gard.

Coahuila, "Santa Rosa, south of the Rio Grande."

Specimens examined: COAHUILA (*Bigelow* of 1853).

*** Stems oval: ribs fewer (5 to 13); spines few (3 to 12), longer, not pectinate.*

– Flowers purple (yellow in flaviflorus).

++ Central spines usually 3 or 4.

18. Cereus engelmanni Parry, Amer. Jour. Sci. ser. 2, xiv, 338 (1852).

Ovate-cylindrical, 12.5 to 30 cm. high (sometimes reaching 45 cm.), 5 to 7.5 cm. in diameter, simple or sparingly branched at base, loosely cespitose (4 to 8 stems together): ribs 10 to 13, tuberculate, with areolæ 4 to 8 mm. apart: radial spines 12 to 14 (usually 13), slender, 6 to 12 mm. long, white with dark tip, upper (about 4) setaceous and much shorter, lateral (6) and lower (3) longer and stouter, straight or a little incurved; centrals 4 (rarely 5), straight and angled, 2.5 to 5 cm. long, cruciate, the 3 upper yellow and erect, the lower one white, porrect or deflexed: flowers purple, 5 to 7.5 cm. long: fruit ovate, fleshy, spiny (at length naked), 4 cm. long, 2.5 cm. in diameter: seed obliquely obovate, black and tuberculate, 1.2 to 1.4 mm. long. (*Ill.* Cact. Mex. Bound. t. 57)—Type, Parry of 1850 in Herb. Mo. Bot. Gard.

From Salt Lake Desert, Utah, westward to the eastern slopes of the California Sierras, and southward into Sonora, and Lower California; also on Cedros Island.

Specimens examined: NEVADA (*Shockley* 313): ARIZONA (*Bischoff* of 1871; *Mrs. Thompson* of 1872; *Coues & Palmer* 303; *Palmer* of 1878): CALIFORNIA (*Parry* of 1850, "Mountains about San Felipe;" *Palmer* of 1870 and 1876; *Lemmon* of 1878; *Engelmann* of 1880; *Parish Bros.* 165 of 1882, San Diego Co.): LOWER CALIFORNIA (*Gabb* 14 of 1867;

Palmer of 1870; *Brandegee* of 1889, San Julio): SONORA (*Schott* of 1855): also growing in Missouri Botanic Garden in 1893.

Dr. Merriam reports that this is the "most widely-diffused *Cereus* over the deserts of southern Nevada and southeastern California." Mr. Brandegee reports it from San Julio and San Pablo, Lower California.

19. Cereus engelmanni variegatus Engelm. Syn. Cact. 283 (1856).

The 3 upper central spines recurved, divaricate, black and white mottled, the lower one longer, white and decurved: fruit 1.2 to 1.6 mm. long. (*Ill.* Pacif. R. Rep. iv, t. 5, f. 4–7)—Type, Bigelow of 1854 in Herb. Mo. Bot. Gard.

From Utah and Nevada southward into Arizona and southeastern California.

Specimens examined: UTAH (*Johnson* of 1870; *Mrs. Thompson* of 1872; *Parry* of 1874; *Palmer* of 1877): NEVADA (*Gabb* of 1867): ARIZONA (*Bigelow* of 1854; *Coues and Palmer* of 1865): CALIFORNIA (*G. R. Vasey* of 1880, San Diego Co.; *Coville & Funston* 187, Death Valley Exped.; *Trelease* of 1892).

20. Cereus engelmanni chrysocentrus Engelm. Syn. Cact. 283 (1856).

More cylindrical: areolæ 12 to 14 mm. apart: upper radial spines 6 to 10 mm. long, lateral 10 to 14 mm., lower 14 to 24 mm.; the three or four upper centrals 5 to 7.5 cm. long, very stout and erect, deep golden yellow, the lower one shorter (3.5 to 6 cm.), white, flattened and deflexed. (*Ill.* Pacif. R. Rep. iv, t. 5, f. 8–10)—Type not found in the Engelmann collection, and probably lost.

Deserts of southeastern California.

Specimens examined: CALIFORNIA (*Coville & Funston* 154, Death Valley Exped.).

The whole series of *engelmanni* forms is exceedingly variable as to color, and relative length and stoutness of the central spines, and forms are frequently found intergrading between the three here recognized.

21. Cereus brandegei, sp. nov.

Size, habit, and number of ribs unknown: ribs tuberculate, with areolæ 10 to 15 mm. apart: spines at first variegated, dark and reddish, becoming more or less ashy-black; radials 10 to 16, rigid, terete, radiant, mostly uniform, 8 to 12 mm. long; centrals almost always 4, very stout and prominent, 3 to 6 cm. long, cruciate, conspicuously angled and compressed, sometimes twisted, the lowest usually the most flattened and sword-like (2 to 3 mm. broad): flowers red, 4 to 5 cm. long, with conspicuous woolly and spine-bearing areolæ over the ovary and lower part of the calyx: ripe fruit not seen.—Type in Herb. Brandegee.

Lower California, El Campo Allemand and San Gregorio.

Specimens examined: LOWER CALIFORNIA (*Brandegee* of 1889).

22. Cereus stramineus Engelm. Syn. Cact. 282 (1856).

Ovate-cylindrical tapering toward apex, 12.5 to 22.5 cm. high and 5 to 7.5 cm. in diameter, cespitose-glomerate (often 100 to 200 heads in

one hemispherical mass): ribs 8 to 13, tuberculate, with areolæ 2 to 2.5 cm. apart: radial spines 7 to 14 (mostly 8), straight or curved, white, 2 to 3 cm. long; centrals 3 or 4, elongated (5 to 8.5 cm.) and angled, straight or variously twisted, often flexuous, straw-colored (often red or brown when young), the upper divergent upwards, the lower one broader, porrect or a little deflected: flowers bright-purple, 7.5 to 10 cm. long: fruit ovate-subglobose, red, 3.5 to 5 cm. long, with bunches of elongated spines, edible: seeds obliquely obovate, tuberculate, 1 to 1.4 mm. long. (*Ill.* Cact. Mex. Bound. t. 46, 47, and 48, f. 1)—Type, Wright of 1851 in Herb. Mo. Bot. Gard.

Abundant between the Pecos and El Paso, Texas, extending eastward in the Rio Grande region, westward to the Gila, and southward into Coahuila and San Luis Potosi.

Specimens examined: TEXAS (*Parry* of 1852; *Bigelow* of 1853; *Lemmon* 304; *Tweedy* of 1880; *Woodward* of 1889, cultivated; *Trelease* of 1892): NEW MEXICO (*Wright* of 1851; *Evans* of 1891, near Juno): ARIZONA (*G. R. Vasey* of 1881, Santa Catalina Mts.; *Rusby* 620 of 1883, Beaver Head; *T. E. Wilcox* of 1894): COAHUILA (*Palmer* 368, 369, 370, 371, 372): SAN LUIS POTOSI (*Parry & Palmer* 277; *Palmer*; *Pringle* 3,495; *Eschanzier* of 1891).

A species remarkable on account of the immense masses it forms covered with long flexuous straw-colored spines. Locally, it is known as "pitahaya" and "strawberry cactus," and Dr. Havard says that the "fruit is equal or superior in quality and flavor to the best strawberry, the thin skin with few spines easily peeling off."

23. Cereus dubius Engelm. Syn. Cact. 282 (1856).

Ovate-cylindrical, cespitose, 12.5 to 20 cm. high, light-green: ribs 7 to 9, broad and tuberculate, with distant areolæ: spines white and somewhat translucent; radials 5 to 8, terete or subangular, 12 to 30 mm. long, upper often wanting; centrals 1 to 4, angled, 3.5 to 7.5 cm. long, straight or often curved: flowers pale-purple, 6 cm. long and wide: fruit 2.5 to 3.5 cm. long, green or purplish, spiny: seed obliquely globose-ovoid, confluent-tuberculate, 1.2 to 1.4 mm. long. (*Ill.* Cact. Mex. Bound. t. 50)—Type, Wright 410 in Herb. Mo. Bot. Gard.

Sandy bottoms of the Rio Grande from El Paso, Texas, downward, and southward in Chihuahua, Coahuila, and San Luis Potosi.

Specimens examined: TEXAS (*Wright* 410; *Parry*): CHIHUAHUA (*Pringle* 252): COAHUILA (*Palmer* of 1880): SAN LUIS POTOSI (*Parry & Palmer* 277).

Closely allied to *stramineus*, but not so cespitose, and spines all white.

24. Cereus acifer Otto; Salm, Cact. Hort. Dyck. 189 (1850).

Plant about 12.5 cm. high and 5 cm. in diameter, branching at base and apex, bright-green: ribs 10, repand, with areolæ 8 mm. apart: spines rigid; radials 8 to 10, radiant, pale-yellowish with reddish base, lower longer, 10 to 20 mm. long; centrals 4, stouter, purplish-brown, the 3 upper erect, the lower one very stout and subdeflexed, about 3.5 cm. long.—Type unknown, unless that cultivated in Hort. Dyck. represents it.

San Luis Potosi.

Specimens examined: SAN LUIS POTOSI (*Parry & Palmer* 278; *Parry* of 1878): also specimens cultivated in Hort. Jacoby in 1857; Hort. Dyck. in 1857; Missouri Botanic Garden in 1883.

25. Cereus flaviflorus Engelm. MSS.

Cylindrical, much branched at base and densely aggregated, forming clumps 3 to 9 dm. in diameter, branches about 30 cm. long or less and 2.5 to 5 cm. in diameter: ribs few, with areolæ far apart: spines very robust and rather irregular; radials about 10, strongly unequal; centrals 4, angled, compressed, straight, curved, or twisted: flowers yellow.—Type, Gabb 10 of 1867 in Herb. Mo. Bot. Gard.

In rocky ground, west of San Borgia, Lower California.

Specimens examined: LOWER CALIFORNIA (*Gabb* 10 of 1867).

This species closely resembles the next, and both are allied to *acifer*. The yellow flowers of this species, however, reported but not preserved by Mr. Gabb, are peculiar in the group. As the material is scanty, and the differences indicated may be specific, Dr. Engelmann's separation of the three species has been preserved.

26. Cereus sanborgianus, sp. nov.

Cylindrical, very much branched at base and densely aggregated, forming clumps 4 to 9 dm. in diameter, branches about 30 cm. long and 2.5 to 6 cm. in diameter: ribs tuberculate, with approximate areolæ: spines pale; radials 12 to 15, very slender but rigid, 7 to 20 mm. long, lower longer and stouter; centrals mostly 4 (rarely 5 to 7), cruciate, very stout, angled and straight, 3 to 6 cm. long, the lower one longest, flat (2.5 mm. broad) and deflexed.—Type, Gabb 9 of 1867 in Herb. Mo. Bot. Gard.

Rocky table lands south of San Borgia, Lower California.

Specimens examined: LOWER CALIFORNIA (*Gabb* 9 of 1867).

This species is indicated as new in Dr. Engelmann's notes, but with no name.

27. Cereus cinerascens DC. Rev. Cact. 116 (1828).

Cylindrical, simple, erect, 20 to 25 cm. high and more, 5 cm. in diameter: ribs 7 or 8, obtuse and tuberculate, with areolæ 10 to 12 mm. distant: spines about 14, white, slender but rigid; radials 10 (in young plants often 8), radiant, 12 to 18 mm. long; centrals 4 (in young plants often 1), erect-divergent, 2.5 cm. long, often somewhat brownish.—Type unknown.

Southern Mexico.

Specimens examined: S. MEXICO (*Bourgeau* 303, "mountains above Guadalupe;" *Gregg* 662).

++ ++ *Central spine solitary, darker.*

28. Cereus fendleri Engelm. Pl. Fendl. 50 (1849).

Cereus fendleri pauperculus Engelm. l. c. 51.

Ovate or ovate-cylindrical, 7.5 to 20 cm. high, 5 to 7.5 cm. in diameter, simple or branching at base, cespitose, dark-green: ribs 9 to 12, straight or oblique, tuberculate, with areolæ 8 to 14 mm. apart: spines stout, very variable in length and color; radials 5 to 10 (mostly 7), straight

or curved, lowest stoutest, white and angular, 12 to 25 mm. long, next 2 almost as long (or longer), more terete, blackish above and white beneath or all blackish, then 2 white or dark or variegated, then 2 weaker, whiter, and shorter (6 to 14 mm.), often 2 more upper spines, and sometimes a slender or stout dark spine (24 to 30 mm. long) on upper edge of areola; central 1, stout and very bulbous at base, curved upward, reddish-black, teretish, 2.5 to 5 cm. long, rarely wanting: flowers deep violet-purple, 6 to 8.5 cm. broad: fruit ovate-globose, 2.5 to 3 cm. long, purplish-green, edible: seed curved, deeply and irregularly pitted, 1.4 mm. long.—Type, Fendler specimens in Herb. Mo Bot. Gard.

From Utah, southward through Arizona, New Mexico, and Southwestern Texas (extending eastward of the Pecos), into Sonora and Chihuahua.

Specimens examined: UTAH (*Ward* of 1875, at Glenwood): ARIZONA (*Coues & Palmer* of 1865; *Pringle* of 1881; *Palmer* 137, Ft. Defiance; *Rusby* 619½; *Trelease* of 1892; *Toumey* of 1892, Tucson; *Wilcox* of 1894, Ft. Huachuca): NEW MEXICO (*Fendler* 4, 62, 273, of 1846 and 1847; *Wright* 161 of 1849; *Thurber* of 1851; *Newberry* of 1858; *Palmer* 135, 137; *G. R. Vasey* of 1881, Socorro; *Rusby* 143, 144; *Evans* of 1891; *E. A. Mearns* 87 of 1892, Apache Mts.): TEXAS (*Wright* 71, 75, 228, of 1851; *Bigelow* of 1852 and 1853; *Trelease* of 1892; *Briggs* of 1892): SONORA (*Schott*): CHIHUAHUA (*Wright* 161, 228; *Bigelow* of 1852 and 1853): also cultivated in Missouri Botanic Garden in 1853.

A plant so variable in its spines that to include all the variations in a specific description is impossible. The chief distinguishing characters are the dark central very bulbous at base and curved upward, and the stout quadrangular lower radial. Pringle of 1881 from Arizona has a lower radial 2.5 to 3.5 cm. long. In his Bibliographical Index Dr. Watson suggests *Mamillaria fasciculata* Engelm[1]., as a synonym; but as that is really a *nomen nudum* it should be dropped.

29. Cereus enneacanthus Engelm. Pl. Fendl. 50 (1849).
Echinocereus enneacanthus Engelm. Wisliz. Rep. 27 (1848).

Ovate-cylindrical, obtuse, 7.5 to 15 cm. high, 3.5 to 6 cm. in diameter, simple or densely cespitose, bright-green: ribs 7 to 10, obtuse and tuberculate, with areolæ 12 to 20 mm. apart: spines stout, straight, angled, translucent; radials 7 to 12 (mostly 8), white, upper 6 to 10 mm. long, lateral 10 to 24 mm., lower 16 to 32 mm.; central 1 (often 1 to 3 additional shorter or almost equal angular ones above and diverging upward), teretish or angular or flattened, white or straw-colored or even darker, 30 to 50 mm. long: flowers bright purplish-red, 5 to 7.5 cm. long: fruit subglobose, 2 to 2.5 cm. long, greenish or purplish, edible: seed obliquely obovate, prominently tuberculate, 1 mm. or less long. (*Ill.* Cact. Mex. Bound. t. 48, f. 2–4, and t. 49)—Type, Wislizenus of 1847 and Gregg of 1847 in Herb. Mo. Bot. Gard.

From the lower Rio Grande, Texas, to El Paso, westward to Arizona and southward into Coahuila and Chihuahua.

Specimens examined: TEXAS (*Wislizenus* of 1847; *Wright* of 1851, and 1853, nos. 4, 5, 27, 28, 31, 97, 231; *Schott* 852; *Nealley* of 1891):

[1] In Emory, Rep. 156, f. 2.

ARIZONA (*Pringle* of 1881): COAHUILA (*Wislizenus* of 1847; *Gregg* 400, 616, of 1847; *Poselger* of 1853): CHIHUAHUA (*Wislizenus* 244 of 1847): also specimens cultivated in Hort. Schafer in 1857; and growing in Missouri Botanic Garden in 1893.

The species is very cespitose, with a wrinkled or withered appearance even in full growth. The central spine is very variable in size, color, and shape; the younger ones being generally terete, yellowish or brownish and at length ashy, while the mature ones are mostly triangular or flattened and white.

30. Cereus mojavensis Engelm. Syn. Cact. 281 (1856).

Ovate, glaucous, 5 to 7.5 cm. high, densely cespitose, forming large masses: ribs 8 to 12, rather obtuse and slightly tuberculate, with areolæ 12 mm. or more apart: spines stout, very bulbous at base, terete or angular, curved and interlocked, white with faintly dusky tips, becoming ashy-gray; radials 5 to 8, upper and lower weaker, 2 to 3 cm. long (upper occasionally much shorter), lateral stouter and 3 to 5 cm. long; central 1 (sometimes wanting), angular and dusky, curved upward, 3.5 to 6 cm. long: flowers deep rich crimson, 5 to 7 cm. long: fruit oblong, 2.5 to 3 cm. long: seed obliquely obovate, black and pitted, 2 mm. long. (*Ill.* Pacif. R. Rep. iv, t. 4, f. 8)—Type, Bigelow of 1854, in Herb. Mo. Bot. Gard.

From the Mohave region of California to Utah and the western border of New Mexico.

Specimens examined: CALIFORNIA (*Bigelow* of 1854; *Parish Brothers* 1167, 1243; *Trelease* of 1892): NEVADA (*Coville & Funston* 321, Lincoln Co.): ARIZONA (*Palmer* 136, Fort Defiance).

The species is easily distinguished from the nearly allied *fendleri* by the longer radial spines, the lowest of which is weakest, and the glaucous hue. The long spines are so curved and interlocked as almost to hide the body of the plant. Mr. Coville, to whom we are indebted for a description of the flower, in the Death Valley Expedition measured one large clump in the Panamint Mountains, which formed a dense oblong mat with the center elevated about 8 inches, with the greatest diameter 40 inches, the shortest 30 inches, and the unusually small and closely packed heads estimated to be about 600.

31. Cereus mojavensis zuniensis Engelm. Syn. Cact. 281 (1856).

Spines weaker, 4-angled, straight or flexuous, the younger ones straw-colored, older ones ashy; radials 8, lowest 12 to 18 mm. long, lateral 18 to 30 mm., uppermost almost as stout and long (2.5 to 3.5 cm.) as the central, which is straight or curved upward, and 3.5 to 5 cm. long. (*Ill.* Pacif. R. Rep. t. 4, f. 9)—Type, Bigelow of 1853 in Herb. Mo. Bot. Gard.

"Canyon Diablo, on the Colorado Chiquito," Arizona.

Specimens examined: ARIZONA (*Bigelow* of 1853).

Distinguished by the long and stout upper radial.

\+ + *Flowers scarlet.*

++ *Ribs 5 to 7: central spine 1* (*or wanting in* paucispinus).

32. Cereus paucispinus Engelm. Syn. Cact. 285 (1856).

Ovate or ovate-cylindrical, 12.5 to 22.5 cm. high, 5 to 10 cm. in diameter, simple or sparingly branched, deep-green: ribs 5 to 7, tuber-

culate, with wide and shallow grooves, and areolæ 16 to 20 mm. apart: spines stout from a bulbous base, straight or somewhat recurved, radiant, 18 to 32 mm. long; radials 3 to 6 (rarely 7), reddish or dark, the lowest one paler, all at length blackish; central none, or very rarely a stout subangular one, 30 to 40 mm. long, reddish-black, turned upward or porrect: flowers purplish-red (when dry), broadly funnelform, 4 cm. long, with a flaring mouth 2.5 to 3 cm. across: fruit unknown: seeds obliquely obovate, tuberculate, 1.4 to 1.6 mm. long. (*Ill.* Cact. Mex. Bound. t. 56)—Type, Wright of 1849 in Herb. Mo. Bot. Gard.

On rocks and gravelly limestone hills, from the San Pedro, Texas, to the mouth of the Pecos; also found near Durango, Col.

Specimens examined: TEXAS (*Wright* of 1849): COLORADO (*Alice Eastwood* of 1890, Durango): also cultivated in Missouri Botanic Garden in 1870.

Distinguished from its allies by its few ribs and few dark spines. The specimens of Miss Eastwood supplied the first flowers recorded.

33. Cereus gonacanthus Engelm. Syn. Cact. 283 (1856).

Ovate, 7.5 to 12.5 cm. high, simple or sparingly branched at base: ribs 7 (sometimes 9), tuberculate, with large areolæ 12 to 20 mm. apart: spines stout, angular, straight, or variously curved and flexuous; radials 8, lower 16 to 24 mm. long, the rest 20 to 30 mm. long, lower and laterals quadrangular, yellow at base and often dark-tipped, uppermost one much larger than the rest, about size and character of the central, which is solitary, very stout, 6- or 7-angled, and deeply furrowed, often flexuous, 3 to 6 cm. long, 2 mm. broad: flower scarlet, about 6 cm. long: fruit and seed unknown. (*Ill.* Pacif. R. Rep. iv, t. 5, f. 2 and 3)—Type, Bigelow of 1853 in Herb. Mo. Bot. Gard.

Southern Colorado and northern New Mexico; found originally on high sand bluffs, under cedars, near Zuñi.

Specimens examined: COLORADO (*Greene* of 1873; *Engelmann* of 1874; *Brandegee* of 1874): NEW MEXICO (*Bigelow* of 1853; *Palmer* 134, Ft. Defiance).

Distinguished from *triglochidiatus* by its stouter, longer, and more numerous spines.

34. Cereus triglochidiatus Engelm. Pl. Fendl. 50 (1849).
Echinocereus triglochidiatus Engelm. Wisliz. Rep. 9 (1848).

Ovate-cylindrical or globose, 5 to 15 cm. high, 5 to 7.5 cm. in diameter, sparingly branched: ribs 6 or 7, undulate, sharp, with very shallow grooves, and areolæ often 3 cm. apart: spines 3 to 6 (mostly 3), stout, compressed and angular, loosely radiant, straight or curved, ashy-gray, the two laterals 16 to 28 mm. long, the other 12 by 16 mm. long and bent downward: flowers deep-crimson, 5 to 7.5 cm. long: fruit unknown, but said to be edible. (*Ill.* Pacif. R. Rep. iv, t. 4, f. 6 and 7)—Type, Wislizenus of 1846 in Herb. Mo. Bot. Gard.

Rocky canyons and mountains, from east of the Pecos, Texas, north-

ward into New Mexico, where it was originally discovered in the high mountains about Santa Fe.

Specimens examined: TEXAS (*Wislizenus* 510 of 1846): NEW MEXICO (*Wislizenus* of 1846; *Fendler* 274 of 1847; *Bigelow* of 1853; *Rothrock* 39; *Broadhead* of 1880; *Engelmann* of 1881; *Lt. McCauley* 574, 575): also cultivated in Mo. Bot. Gard. in 1863.

35. Cereus hexaedrus Engelm. Syn. Cact. 285 (1856).

Ovate, 10 to 15 cm. high, 5 to 6 cm. in diameter, simple or sparingly branched at base: ribs 6, obtuse, somewhat interrupted, with wide shallow groove and areolæ 12 to 16 mm. apart: spines straight, angular, rigid from a bulbous base, but slender; radials 5 to 7 (mostly 6), yellowish-red, lower shorter (10 to 20 mm.), upper often stouter and darker, 16 to 30 mm. long; central solitary, a little stouter, acutely angled, 24 to 30 mm. long, often wanting: flowers and fruit unknown. (*Ill.* Pacif. R. Rep. iv, t. 5, f. 1)—Type, Bigelow of 1853 in Herb. Mo. Bot. Gard.

On sandy hills, under cedars, about 15 miles west of Zuñi. New Mexico; apparently not discovered since.

Specimens examined: NEW MEXICO (*Bigelow* of 1853).

Allied to *paucispinus*, but distinguished by its slender and angular spines.

++ ++ *Ribs 8 to 13: central spines 2 to 7 (1 in* octacanthus)

36. Cereus octacanthus (Muhlenpf.).

Echinopsis octacantha Muhlenpf. Allg. Gart. Zeit. xvi, 19 (1848).
Cereus roemeri Engelm. Pl. Fendl. 50 (1849), not Muhlenpf. (1848).

Ovate, bright-green, 7.5 to 10 cm. high, 3.5 to 6 cm. in diameter, densely cespitose (often 5 to 12 heads from the same base), sometimes simple: ribs 7 to 9, tuberculate, obtuse, with areolæ 8 to 16 mm. apart: spines stout, terete, white (or yellowish when young) at length ashy; radials 7 or 8, 10 to 24 mm. long, upper a little shorter, lateral longest; central solitary, stouter, porrect, 20 to 30 mm. long: flower red, 5 cm. long and 2.5 cm. wide, red: fruit and seed unknown.—Type unknown.

From extreme southwestern Texas, northward and westward through New Mexico into Utah.

Specimens examined: TEXAS (*Evans* of 1891, about El Paso): NEW MEXICO (*Fendler* 272 of 1846, in part): UTAH (*Mrs. Thompson*): also cultivated in Mo. Bot. Gard. from Herb. Torr.

37. Cereus roemeri Muhlenpf. Allg. Gart. Zeit. xvi, 19 (1848), not Engelm. (1849).

Cereus phœniceus conoideus Engelm. Syn. Cact. 284 (1856).
Cereus conoideus Engelm. Pacif. R. Rep. iv, 36 (1856).

Ovate, conoid-acutish at apex, 7.5 to 10 cm. high, sparingly branched at base: ribs 9 to 11, obtuse, tuberculate, with areolæ 8 to 12 mm. apart: spines whitish or straw-color, translucent, with bulbous base; radials 8 to 12, slender and rigid, straightish, upper 4 to 10 mm. long, lateral 12 to 30 mm.; centrals 3 to 5 (usually 4), very bulbous, upper hardly longer than lateral radials, lowest quadrangular, often dusky

when young, 2.5 to 7.5 cm. long, porrect or deflexed: flower crimson, 8 to 10 cm. long, 3.5 to 5 cm. broad: fruit and seed unknown. (*Ill.* Pacif. R. Rep. iv, t. 4, f. 4 and 5)—Type unknown.

From the upper Pecos, New Mexico, westward through Arizona into southern California, and southward into Chihuahua.

Specimens examined: NEW MEXICO (*Palmer* 73 of 1869; *E. A. Mearns* 88 of 1892, Big Hatchet Mts.): ARIZONA (*Newberry* of 1858; *Coues & Palmer* of 1865): CALIFORNIA (*Parish Bros.* of 1882): CHIHUAHUA (*Pringle* 252 of 1885).

In most of the specimens I have seen the centrals are dark ashy-gray, contrasting strongly with the pale and much shorter radials.

38. Cereus aggregatus (Engelm.).

Mamillaria aggregata Engelm. Emory's Rep. 155 (1848).
Echinocereus coccineus Engelm. Wisliz. Rep. 9 (1848), not DC. or Salm.
Cereus coccineus Engelm. Pl. Fendl. 50 (1849).
Cereus phœniceus Engelm. Syn. Cact. 284 (1856).

Ovate or subglobose, obtuse, 3.5 to 7.5 cm. in height, 3 to 5 cm. in diameter, cespitose (mostly in dense hemispherical masses 30 to 100 cm. in diameter): ribs 8 to 11, tuberculate, with areolæ 6 to 8 mm. apart: spines slender, almost setaceous, straight, terete; radials 8 to 12, white, 6 to 12 mm. long, upper much the shorter; centrals 1 to 3, a little stouter, white or horny, 10 to 20 mm. long: flower deep-crimson, 3.5 to 6 cm. long, 2.5 to 3.5 cm. broad: fruit and seed unknown. (*Ill.* Emory's Rep. 155, f. 1; Pacif. R. Rep. iv, t. 4, f. 1–3)—Type not preserved, but Wislizenus of 1846, type of *coccineus* Engelm., and Bigelow of 1852 and 1853, type of *phœniceus* Engelm., are in Herb. Mo. Bot Gard.

From southern Colorado to Arizona and southwestern Texas, and southward into San Luis Potosi.

Specimens examined: COLORADO (*Parry* of 1867; *Greene* of 1873): ARIZONA (*Bigelow* of 1853; *Newberry* of 1858; *Coues & Palmer* 193 of 1865; *Toumey* of 1892): NEW MEXICO (*Wislizenus* of 1846; *Rusby* of 1881, Burro Mts.): TEXAS (*Lindheimer* of 1847; *Gregg* 662 of 1848; *Bigelow* of 1852 and 1853): SAN LUIS POTOSI (*Eschanzier* of 1891): also cultivated in Mo. Bot. Gard. in 1851.

The dense cespitose masses often contain 100 to 200 heads, and are "often the shape and size of a bushel basket." It is said generally to grow on naked rocks. The Eschanzier specimens, from San Luis Potosi, have uniformly 2 centrals and yellowish spines.

39. Cereus polyacanthus Engelm. Pl. Fendl. 50 (1849).

Echinocereus polyacanthus Engelm. Wisliz. Rep. 20 (1848).

Ovate-cylindrical, 10 to 25 cm. high, 6 to 10 cm. in diameter, cespitose, pale-green or glaucous: ribs 9 to 13, obtuse, tuberculate, with areolæ 1 to 2.5 cm. apart: spines stout, rigid, terete, straight, white or ashy-red, all at length ashy, very variable; radials 8 to 12, spreading, but not strictly radiating, upper 12 mm. long, lateral and lower 18 to 25 mm.; centrals 3 or 4, stouter and bulbous at base, as long as or longer than the radials (lower one sometimes 3 to 6 cm.), often variegated when

young, the 3 upper turned upward, the lower porrect or deflexed: flowers deep-red, 5 to 7.5 cm. long, profusely covering the plant: fruit subglobose, 2 to 3 cm. long, greenish-purple: seed oblique, irregularly tuberculate, 1.6 to 1.8 mm. long. (*Ill.* Cact. Mex. Bound. t. 54 and 55)—Type, Wislizenus of 1846 in Herb. Mo. Bot. Gard.

From the region about El Paso, Texas, westward into Arizona, and southward into Lower California and the mountains of Chihuahua. Doubtless also in southern California.

Specimens examined: TEXAS (*Wright* 41, 222, of 1852; *Thurber* 191,192; *Trelease* of 1892): NEW MEXICO (*Wright* 41 of 1852; *G. R. Vasey* of 1881, Socorro; *Nealley* of 1891; *Evans* of 1891): ARIZONA (*Palmer* of 1876 and 1890; *Pringle* of 1881, Santa Rita Mts.; *Rusby* 620; *Evans* of 1891; *Wilcox* of 1894): CHIHUAHUA (*Wislizenus* of 1846 and 1854; *Pringle* 253): LOWER CALIFORNIA (*Orcutt* of 1883; *Brandegee* of 1890, La Paz).

40. Cereus maritimus Jones, sp. nov.

Closely allied to *polyacanthus*, but with spines all reddish-brown at first, becoming ashy, 4 or 5 erect-spreading terete or somewhat angular stout centrals 20 to 35 mm. long, 8 to 12 much smaller and slender but rigid radiately spreading very unequal radials (upper and laterals 8 to 10 mm., lower 4 to 6 mm.), and red flowers 3 to 4 cm. long.—Type in Herb. Jones.

Lower California.

Specimens examined: LOWER CALIFORNIA (*Jones* of 1882, Encenada; *Orcutt* of 1885, Todos Santos Bay; *Brandegee* of 1889, El Rosario).

41. Cereus pacificus (Engelm.).

Cereus phœniceus pacificus Engelm. West Amer. Sci. ii, 46 (1886).

Cylindrical, 15 to 25 cm. high, 5 to 6 cm. in diameter, cespitose in dense cushions 30 to 60 cm. in diameter (50 to 100 stems in each): ribs 10 to 12, obtuse, with shallow intervals: spines at first gray and more or less reddish-tinged, finally becoming ashy; radials 10 to 12, 5 to 10 mm. long, no upper ones (or occasionally a minute spine); centrals 4 or 5, widely divergent, the lowest largest, 20 to 25 mm. long: flowers deep-red, the floriferous areola spiniferous: fruit spinose.—Type, Orcutt specimens in Herb. Mo. Bot. Gard.

Lower California and adjacent islands.

Specimens examined: LOWER CALIFORNIA (*Orcutt* of 1883 and 1886, Todos Santos Bay; *Brandegee* of 1889, Magdalena Island and Comondu Cliffs, of 1890, Sierra de la Laguna, of 1893, San Pedro Martio).

But a few plants were found in bloom, January 26, 1883, by Mr. Orcutt, whose notes concerning them were first published in *The West American Scientist*,[1] but since then abundant material has been collected by Mr. Brandegee. The spine we have called the uppermost central, by some might be considered an uppermost radial, the great irregularity of the spines in position making possible different interpretations.

[1] ii, 46.

* * * *Stems short-cylindrical, 4- to 6-ribbed, jointed, procumbent: flowers purple.*

42. Cereus berlandieri Engelm. Syn. Cact. 286 (1856).

Subterete, jointed, very branching, spreading and procumbent, with erect branches, joints or branches 3.5 to 15 cm. long, 2 to 2.5 cm. in diameter: ribs 5 or 6, with distinct conical tubercles and areolæ 8 to 12 mm. apart: radial spines 6 to 8, setaceous, white, radiant, 8 to 10 mm. long; central solitary, yellowish-brown, 10 to 25 mm. long: flowers purple, 5 to 10 cm. long: fruit ovate, green, nearly dry, densely covered with mottled bristles, 18 mm. long: seed obovate-subglobose, strongly tuberculate, 1 mm. long. (*Ill.* Cact. Mex. Bound. t. 58)—Type, Berlandier 2423 in Herb. Mo. Bot. Gard.

Southeastern Texas; found originally on the Nueces.

Specimens examined: TEXAS (*Berlandier* 2423; *Wright* 993; *Haege* of 1866): also cultivated in Breslau Bot. Gard. in 1866; in Harvard Bot. Gard. in 1871 and 1882; in Mo. Bot. Gard. in 1845, and growing in same garden in 1892 and 1893.

Very closely allied to *C. pentalophus* DC., but Salm cultivated both species and considered them distinct.

43. Cereus procumbens Engelm. Pl. Fendl. 50 (1849).

Subterete or 4- or 5-angular, very branching and diffuse, joints or branches much contracted at base, 1.2 to 10 cm. long, 12 to 16 mm. in diameter: tubercles distinct, 8 to 10 mm. apart, in 4 or 5 rows: spines slender, rigid, dark-tipped; radials 4 to 6 (mostly 5), white, radiant, 2 to 4 mm. long; central solitary, stouter, dark, directed upward, 4 to 6 mm. long, often wanting: flower delicate-purple, over 7.5 cm. long: fruit ovate, green, 12 to 16 mm. long: seed lenticular, lightly verrucose, 0.8 to 1.0 mm. in diameter. (*Ill.* Cact. Mex. Bound. t. 59, f. 1–11)—Type, "St. Louis Volunteers" of 1846 in Herb. Mo. Bot. Gard.

On the Rio Grande below Matamoras, Tamaulipas.

Specimens examined: TAMAULIPAS ("St. Louis Volunteers" of 1846): also cultivated in Harvard Bot. Gard. in 1848, 1871 and 1882; growing in Mo. Bot. Gard. in 1893.

* * * * *Stems very slender-cylindrical, 8-ribbed, erect: flowers rose-color: roots tuberous.*

44. Cereus poselgeri, nom. nov.

Cereus tuberosus Poselger, Allg. Gart. Zeit. xxi, 135 (1853), not Pfeiff. Enum. 102 (1837).

Very slender from a tuberous root, terete, woody below, thickened upward, sparsely branching, weak, erect or reclined, joints or branches 30 to 60 cm. long, 8 to 16 mm. in diameter: ribs 8, scarcely prominent, with small crowded areolæ: spines minute and setaceous; radials 9 to 12, white, straight and appressed, hardly 2 mm. long; central solitary whitish or brown-tipped or all brown or black, appressed upward, 4 to 6 mm. long: flowers rose or purple, 5 cm. long and broad: fruit nearly dry, covered with long wool and black and white bristles: seed obliquely obovate, confluently tuberculate, 0.8 mm. long. (*Ill.* Cact. Mex. Bound. t. 59, f. 12)—Type, Poselger of 1853 in Herb. Mo. Bot. Gard.

Dry, rocky ridges, among supporting shrubs, on both sides of the Lower Rio Grande.

Specimens examined: TEXAS (*Poselger* of 1853): COAHUILA (*Siler* of 1889): also cultivated in Goebel's Gard. in 1859; Mo. Bot. Gard. in 1863; Meehan's Gard. in 1869.

The most slender of the *Echinocerei*, connected with the globose and ovate forms through *berlandieri* and *procumbens*. Always grows among shrubs which support its weak and otherwise decumbent stem. The lower part of the stem is scarcely as thick as a quill, and the tuberous root is globular, 1 to 3 cm. in diameter.

II. EUCEREUS. *Stems cylindrical: seeds smooth or pitted: embryo curved.*

* *Not arborescent.*

– *Tall (6 to 30 dm.), slender: ribs 3 to 7.*

†† *Flowers white.*

45. Cereus monoclonos DC. Prodr. iii, 464 (1828).

Stem columnar, 12 to 30 dm. high: ribs 6 to 8, obtuse, compressed: spines short and brownish, radiant, some of them very rigid and 3.5 cm. long: flowers white, 15 cm. long.—Type unknown.

A West Indian species, extending into Florida.

Specimens examined: FLORIDA (*Curtiss* of 1882): also growing in Mo. Bot. Gard. in 1893.

In the Kew Index this species is referred to *C. peruvianus*,[1] but we have had no opportunity of comparing it with that species.

46. Cereus marginatus DC. Rev. Cact. 116 (1828), not Salm (1850).

Stem simple or branching at apex, erect, dark-green, 5 to 7.5 cm. in diameter: ribs 5 to 7, obtuse, with acute intervals, woolly through the whole length on account of the confluent areolæ: spines 7 to 9, short (4 to 6 mm.) and conical, rigid, grayish (younger ones purplish-black, the central scarcely distinct from the rest): flower brownish-purple, slender-tubular, 3.5 cm. long: fruit globular and spiny.—Type unknown.

From San Luis Potosi southward throughout Mexico.

Specimens examined: SAN LUIS POTOSI (*Weber* of 1865; *Parry & Palmer* 275; *Parry* of 1878; *Pringle* 2678): also cultivated in Hort. Pfersdorff in 1869.

The stem is often covered with a woody crust, and the woolly confluent areolæ are often double. It is said to be frequently used for hedges in southern Mexico.

47. Cereus geometrizans Mart. Pfeiff. Enum. 90 (1837).

Stem erect, simple, bluish, 10 cm. in diameter: ribs 5 to 9 (mostly 5 or 6), obtuse, repand-tuberculate, with broad intervals and areolæ 3 to 3.5 cm. apart: spines 3 to 6, unequal, stout, blackish and at length ashy; lateral radials longest (8 to 10 mm.), lowest shorter (4 to 6 mm.), uppermost 1 or 2 (often wanting) very short (2 mm.), sometimes all very short; central solitary, very long and stout, often angular, sometimes

[1] Mill. Gard. Dict. ed. 8, no. 4.

wanting: flowers 2 cm. high, 3 cm. broad, pinkish-white (in dried specimens).—Type unknown.

From San Luis Potosi southward throughout Mexico.

Specimens examined: SAN LUIS POTOSI (*Poselger* of 1850; *Parry & Palmer* 274; *Parry* of 1878; *Pringle* 3743): also cultivated in Hort. Pfersdorff in 1869.

Pringle's specimens are in flower, and from them the above description of the flower is taken. The radials are also shorter than in the original description as given above, varying from 3 to 5 mm. in length, with the stout central about 3 cm. long. The radials are always 5 in the specimens examined, their broad bases in contact, forming a regular hexagon, with the spine that would form the uppermost angle wanting and replaced by the floriferous areola. The broad base of the very stout solitary central is in contact with the bases of all the radials, completely filling up the space. In one case observed the central was but 8 mm. long and the radials very minute.

48. Cereus greggii Engelm. Wisliz. Rep. 18 (1848).
Cereus pottsii Salm, Cact. Hort. Dyck. 208 (1850).
Cereus greggii transmontanus Engelm. Syn. Cact. 287 (1856).

Stem slender, erect, 6 to 12 cm. high, 18 to 25 mm. in diameter, from a very large tuberous root (often 15 to 25 cm. long and 10 to 15 cm. in diameter); branches erect, reddish or dark-green: ribs 3 to 6 (usually 4 or 5), acute, with crowded areolæ: spines abruptly subulate from a bulbous base, very short (1 to 2 mm.) and sharp, blackish at length ashy; radials 6 to 9, subrecurved, the lowest slenderer and longer; centrals 1 or 2 (when 2 they are in the same vertical plane and divergent upward and downward): flowers whitish or ochroleucous, 15 to 20 cm. long, 5 to 6 cm. broad: fruit ovate, attenuate at base and acuminate, 2.5 to 3.5 cm. long, 2.5 cm. in diameter, bright-scarlet, fleshy and edible: seeds obliquely obovate, rugose, black, 2.5 to 3 mm. long. (*Ill.* Cact. Mex. Bound. t. 63–65)—Type, Gregg 222 and 599 in Herb. Mo. Bot. Gard.

From southwestern Texas (Pecos and westward), westward through southern New Mexico into Arizona, and southward into Chihuahua and Sonora. In gravelly or hard clayey soil.

Specimens examined: TEXAS (*Wright* 347, 513, of 1852; *Bigelow* of 1852; *Parry* of 1853; no date or collector, foothills near Alpine): NEW MEXICO (*Evans* of 1891): ARIZONA (*Bendire* of 1872; *Engelmann* of 1880; *Pringle* 10; *Toumey* of 1892, Tucson; *Trelease* of 1892): CHIHUAHUA (*Gregg* 222, 599).

This very characteristic species seems to be scattered and rare throughout its range. A single slender stem usually arises from the enormous root, but sometimes there may be many stems.

49. Cereus pitajaya (Jacq.) DC. Prodr. iii, 466 (1828).
Cactus pitajaya Jacq. Enum. Pl. Carib. 23 (1763).
Cereus undulosus DC. Rev. Cact. 46 (1829).
Cereus lætevirens Salm, Cact. Hort. Dyck. 336 (1834).
Cereus variabilis Pfeiff. Enum. 105 (1837), not Engelm. (1850).

Stem simple or branching at base, suberect, green or glaucescent, 3.5 to 7.5 cm. in diameter: ribs 3 to 5, obtuse and repand, with areolæ 8 to 16

mm. apart: spines straight and rigid; radials 6 to 8, white, yellowish or blackish, the 3 highest more rigid, 16 to 20 mm. long, the lower 4 or 5 more slender, 6 to 8 mm. long; centrals 1 or 2, 12 to 25 mm. long.—Type unknown.

A common and widely distributed species of the West Indies, southern Mexico, Central America, Peru, and Brazil.

Specimens examined: CUBA (*Wright* 2624).

A very variable species, the joints being very long and quadrangular, and ovate and triangular on the same plant; the areolæ sometimes with whitish and sometimes with brownish tomentum; the spines sometimes short and white, and sometimes elongated, rigid and fuscous. The north Mexican form referred to this species by Dr. Engelmann is *Cereus princeps* Pfeiff.

50. Cereus princeps Hort. Wuerzb.; Pfeiff. Enum. 108 (1837).
Cereus variabilis Engelm. Pl. Lindh. 205 (1850), not Pfeiff. (1837).

Stems erect, 9 to 30 dm. high, 5 cm. in diameter, 3- or 4-angular, and with distant areolæ: spines 4 to 6, stout and radiant, unequal, the larger 25 to 35 mm. long, the central deflexed: flower long-tubular, 17.5 to 20 cm. long, 13.5 to 15 cm. broad: fruit oval, spiny, 5 to 7.5 cm. long, 5 cm. in diameter, scarlet and with luscious red pulp: seeds obliquely obovate, smooth and shining, 3 to 3.4 mm. long. (*Ill.* Cact. Mex. Bound. t. 60. f. 5 and 6)—Type unknown.

On the Mexican side of the lower Rio Grande.

Specimens examined: TAMAULIPAS (*St. Louis Volunteers* of 1846; *Poselger* of 1850; *Schott* of 1853): also cultivated in Mo. Bot. Gard. in 1849, 1859, 1867, 1870, 1871, and 1873; also in Harvard Bot. Gard. in 1872.

Probably to be found on the Texan side of the lower Rio Grande. The young shoots are said to have 8 ribs and more numerous slender spines; and in some of the cultivated specimens the spines become much longer than in the description.

51. Cereus palmeri Engelm. MSS.

Stems branching, 3- or 4-angled, 12 to 15 dm. high: spines in greenish-brown bunches: fruit greenish-yellow, its areolæ bearing 5 to 8 short stout spines.—Type, Palmer 70 of 1869 in Herb. Mo. Bot. Gard.

Sonora.

Specimens examined: SONORA (*Palmer* 70 of 1869).

This very brief and unsatisfactory diagnosis was drawn by Dr. Engelmann from a few scraps and notes, a diagnosis that I have no means of supplementing. Dr. Palmer's notes further state that the "branching plant is weighed down by the heavy fruit."

++ ++ *Flowers purple.*

52. Cereus striatus Brandegee, Zoe, ii, 19 (1891).

Stems weak, quadrangular, becoming terete, very sparingly branched above, ash-color, about 10 dm. high and 2 to 6 mm. in diameter: ribs or striations 9, flat and slightly raised above the flat greener intervals, with areolæ about 6 mm. apart: spines about 9, soft, closely appressed, either light-colored or brown; sometimes perfectly black, 1 to 3 mm. long: flowers purple, 10 to 12 cm. long, the elongated tube bristly: fruit

obpyriform, 3 to 4 cm. long, 2 to 2.5 cm. in diameter, bright-scarlet and spiny: seeds angular, black, minutely pitted.—Type, Brandegee 243 in Herb. Brandegee.

San Jose del Cabo, Lower California, and northward beyond San Ignacio; also on Carmen, Magdalena, and Santa Margarita Islands.

Specimens examined: LOWER CALIFORNIA (*Brandegee* of 1889, San Joaquin, Magdalena Bay, Santa Margarita Island; also 243 of 1890, San Jose del Cabo; *Palmer* of 1890, Carmen Island).

Mr. Brandegee says that the weak stems, no thicker than straws, are supported by bushes, and being of the same ashen hue as the bushes are concealed until in flower or fruit; and that the spines are so soft that the plant can be easily handled. The local name is "pitahayita," from the resemblance of the flowers and fruits to those of *gummosus*, which is "pitahaya."

53. Cereus cochal Orcutt, West Amer. Sci. vi, 29 (1889).

Trunk stout, 3 dm. or more high before dividing into numerous stout branches, these repeatedly forking so as to give to the whole plant (growing 12 to 30 dm. high) a graceful "candelabra shape": ribs 4 to 8, obtuse, with wide shallow intervals and areolæ 2 to 2.5 cm. apart: spines few, stout, straight and compressed, grayish or black; radials mostly 5, 15 to 20 mm. long; central solitary, more robust, laterally compressed, about 18 to 25 mm. long: flowers purplish-green, 2 to 3 cm. long: fruit the shape and size of an olive, not spiny, red (frequently grayish or yellowish-brown).—Type, in Herb. Orcutt.

Lower California.

Specimens examined: LOWER CALIFORNIA (*Gabb* 8 of 1867; *Brandegee* of 1889, Comondu and San Pablo).

This species was collected by Gabb in 1867, and is described as a new species in Dr. Engelmann's manuscript notes as *C. gabbii*. In 1886, however, Mr. Orcutt discovered it and published the name as above, being the Mexican and Indian name of the plant. Mr. Orcutt says that it is "abundant among the hills of Lower California, from Todos Santos Bay southward to the Rosario and San Fernando missions, or further." The short woody trunk is said to be often 3 dm. in diameter, the long branches 6 to 20 cm. in diameter.

54. Cereus eburneus (Link) Salm, Observ. Botan. 6 (1822).
Cactus eburneus Link, Enum. ii, 22 (1822).

Stem erect, simple, glaucous: ribs 7 to 10, obtuse and very glabrous, with ashy, naked, somewhat remote areolæ: spines subulate, rigid, ivory-white with black tip (purplish when young); radials 8 to 10, radiant, 8 to 10 mm. long, lowest smallest; central 1 (rarely 3 or 4), 18 to 22 mm. long: flowers purplish: fruit unknown.—Type unknown.

In the West Indies, and from San Luis Potosi southward through Mexico and Central America into Chile. Reported originally from Mexico in "22° lat., at altitude of 6–8000 ft."

Specimens examined: CUBA (*Wright* 2620): SAN LUIS POTOSI (*Parry & Palmer* 276).

++ *Procumbent, 3 to 12 dm. long.*

+ *Ribs 3.*

55. Cereus grandiflorus (L.) Mill. Dict. ed. 8, no. 11 (1768).
Cactus grandiflorus L. Sp. Pl. i, 467 (1753).

Creeping, diffuse, pale-green, with very long and flexuous climbing 5- to 7-angled branches 12 to 20 mm. in diameter, with white bristly areolæ 10 to 15 mm. apart: spines short, 4 to 6 mm long; radials 4 to 8, scarcely pungent, yellowish or white; centrals 1 to 4, equaling in length the white bristles: flowers white and fragrant, 15 to 20 cm. broad.—Type unknown.

In the West Indies and Sonora, though doubtless with a much more southern Mexican extension. On rocks and decayed trees.

Specimens examined: SONORA (*Schott* of 1859 and 1865): also cultivated in Hort. Francofurt. in 1825; in Hort. Genéve in 1859; in Goebel's Gard. in 1860; in Harvard Bot. Gard. in 1864, 1865, 1882.

Long cultivated in gardens as the "night-blooming cereus," and made to vary widely.

56. Cereus nycticalus Link, Verh. Preuss. Gartenb. Ver. x, 373 (1834).
Cereus pteranthus Link, Otto & Diet. Allg. Gart. Zeit. ii, 209 (1834).

Suberect, very long-jointed, radicant, 15 to 25 mm. in diameter; joints various, some subcylindrical with 4 or 5 series of areolæ, others 4- to 6-angular: ribs when young acute, later obtuse, with areolæ 8 to 20 mm. apart: spines 1 to 4, very small (2 to 4 mm.) and rigid, sometimes with white setæ 4 to 6 mm. long, often deciduous: flowers white and fragrant, 17.5 cm. long. (*Ill.* l. c. t. 4)—Type unknown.

Credited in general to Mexico, but no definite station known.

Specimens examined: cultivated in Greeve's Gard. in 1859; in Goebel's Gard. in 1860; in Harvard Bot. Gard. in 1871; in Mo. Bot. Gard. in 1862, and growing in same garden in 1893.

57. Cereus napoleonis Graham in Hook. Bot. Mag. t. 3458 (1836).
Cactus napoleonis Hort. ex Graham, l. c.
Cereus triangularis major Pfeiff. Enum. 117 (1837).

Suberect, long-jointed; joints triquetrous with flat sides, slender, 30 cm. or more long, 20 to 25 mm. in diameter: ribs acute, undulate, with areolæ 12 to 16 mm. apart and scarcely tomentose: spines 3 or 4, subulate, unequal, straight, black, 8 to 16 mm. long, the lowest mostly longest; sometimes a few white setæ: flowers snowy white, 20 cm. long and 15 cm. broad: fruit bluish, spiny, 10 cm. long and 8 cm. in diameter. (*Ill.* l. c.)—Type unknown.

Tamaulipas and southward in Mexico, and in the West Indies.

Specimens examined: TAMAULIPAS (*Poselger* of 1850, at Tampico): also cultivated in Harvard Bot. Gard. in 1882.

58. Cereus compressus Mill. Gard. Dict. ed. 8, no. 10 (1768).
Cereus triangularis Haw. Syn. 180 (1812), not (L.) Mill. (1768).

Suberect, bright-green, branching, the branches scandent, radicant, triquetrous with one face nearly flat and the other two deeply sulcate;

joints broad, over 30 cm. long, 5 to 7.5 cm. broad, sometimes twisted, the younger ribs compressed as if winged, with almost naked areolæ 2.5 cm. apart: spines 2 to 4, blackish, rigid, subrecurved, 2 to 4 mm. long, lowest longest: flowers white, 20 cm. broad: fruit naked, scarlet, "size and form of a goose's egg."—Type unknown.

In Key West and the West Indies, and extending in Mexico from Vera Cruz to the Isthmus of Darien.

Specimens examined: VERA CRUZ (*Bourgeau* 2488, region of Orizaba): ISTHMUS OF DARIEN (*Schott* of 1858): also cultivated in Hort. Monaco in 1857 and 1858; in Koenig's Gard. in 1866; in Harvard Bot. Gard. in 1871, 1873, 1882; growing in Mo. Bot. Gard. in 1893.

Climbing over bushes and rooting at the joints. The surface of the older joints is often covered with a woody crust, and the very old ones become altogether woody.

++ ++ *Ribs 7 to 12: spines few (8 to 12).*

59. Cereus boeckmanni Otto; Salm, Cact. Hort. Dyck. 217 (1850).

Tall, bright-green, subcylindrical, 18 to 20 mm. in diameter, with elongated flexuous and radicant branches: ribs 7, sinuate-repand, with areolæ 12 to 16 mm. apart: spines very small (scarcely 1 mm.) and rigid, the 3 upper brown, 3 lower gray, and the solitary central brown: flower and fruit unknown.—Type unknown.

"Northern Mexico."

Specimens examined: NORTHERN MEXICO (*Lindheimer* of 1873).

60. Cereus gummosus Engelm. Zoe, ii, 20 (1891).

Prostrate and assurgent, 3 to 12 dm. long, 7.5 to 10 cm. in diameter, dull purplish-green: ribs (in young branch) 7 to 9, tuberculate, with sharp narrow intervals and prominent areolæ 18 to 20 mm. apart: spines stout and rigid, from a strongly bulbous base, black; radials about 12, the laterals longest (6 to 12 mm.), the lowest smallest; centrals 3 to 6, stout, angled and compressed (sometimes quite flat), 18 to 35 mm. long, often with 2 very small additional ones above: flowers 10 to 12.5 cm. long, purple: fruit subglobose, 6 to 8 cm. in diameter, spiny, bright-scarlet with purple pulp ("color of ripe watermelon"), acid and pleasant: seeds obliquely obovate, compressed and keeled, rugose and pitted, 2.5 mm. long.—Type, Parry specimens in Herb. Mo. Bot. Gard.

Lower California, especially abundant in the "Cape Region."

Specimens examined: LOWER CALIFORNIA (*Parry*, with no date or station; *Miss Fish* of 1882, Sanzal; *Brandegee* of 1889, San Pablo and Magdalena Island, also of 1890, San José del Cabo).

This species seems to have been noted first by Brandegee in his Plants of Baja California, 162 (1889), where it is said to be the "pitahaya" of southern Lower California. the fruit of which is held in high esteem. It is also said that the bruised stems are used for stupefying fish. Dr. Parry's notes, with the original specimens (described by Englemann in manuscript in 1882), state that "the internal cellular tissue is bright-yellow in dried-up trunks, changing to a dense resinous gum, which is ground up and mixed with oil for varnish; also used as pitch for calking boats." This fact suggested the specific name.

61. Cereus flagelliformis (L.) Mill. Dict. ed. 8, no. 12 (1768).
Cactus flagelliformis L. Sp. Pl. i, 467 (1753).

Creeping or pendent, slender and very branching, cylindrical, 16 to 20 mm. in diameter, branches 3 dm. long or more: ribs 10 to 12, tuberculate, with areolæ scarcely tomentose and 6 to 8 mm. apart: spines short (4 to 6 mm.) and rather rigid; radials 8 to 12, stellate and reddish-brown; centrals 3 or 4, a little larger, brown with golden tip; young spines all red: flowers funnelform, crimson, 6 to 7.5 cm. long: fruit globose, 12 mm. in diameter, reddish and bristly, the pulp greenish-yellow ("with the taste of a prune").—Type unknown.

From Chihuahua and the West Indies southward; widely distributed in Tropical America, and frequently seen as an ornamental plant.

Specimens examined: CHIHUAHUA (*Wislizenus* 227 and 248): also cultivated in Mo. Bot. Gard. in 1854; in Goebel's Gard. in 1863; in Harvard Bot. Gard. in 1867.

++ ++ ++ *Ribs many (15 to 21): spines numerous (20 to 50).*

62. Cereus emoryi Engelm. Amer. Jour. Sci. ser. 2, xiv, 338 (1852).

Prostrate, cylindrical, 6 to 12 dm. long, with ascending or erect branches 15 to 25 cm. high and 3.5 to 5 cm. in diameter: ribs 15, tuberculate, with acute intervals and areolæ 6 to 8 mm. apart: spines straight, slender and rigid, yellow, interlocked; radials 40 to 50, very slender and stellately porrect; central solitary, stouter and much larger: flowers greenish-yellow, 3 to 6 cm. broad: fruit globose, very spiny, 3.5 cm. in diameter: seeds obovate, acutely keeled, shining and very minutely tuberculate, 2.4 to 2.8 mm. long. (*Ill.* Cact. Mex. Bound. t. 60, f. 1–4)—Type, Parry of 1850 in Herb. Mo. Bot. Gard.

On rocky hills, etc., from southern California (about Los Angeles and San Diego) southward into Lower California, and on the adjacent islands (San Clemente, Santa Catalina, Cedros).

Specimens examined: CALIFORNIA (*Parry* of 1850; *Cooper* of 1862; *Childs* of 1862; *Brewer* 248; *Agassiz* of 1872; *Hitchcock* of 1875; near San Diego, no collector noted, in 1876); LOWER CALIFORNIA (*Gabb* 4 of 1867; *Pringle* of 1882; *Brandegee* of 1889, El Rosario).

Grows in thick masses, covering patches 30 to 60 dm. square. The Gabb specimens show four central spines, but only the lower one is long.

63. Cereus mamillatus Engelm. MSS.

Stems aggregated, branching at base, the branches cylindrical, 25 to 30 cm. long and 3.5 to 6 cm. in diameter: ribs 20 to 25, oblique, strongly compressed, broken up into hemispherical tubercles: spines short and bulbous at base; radials 10 to 25, 3 to 12 mm. long, the lower ones the more robust and longer; centrals 3 or 4, 10 to 25 mm. long, the lowest longest and deflexed: flower and fruit unknown.—Type, Gabb 16 in Herb. Mo. Bot. Gard.

"On mountain sides in gravelly loam, south of Moleje," Lower California.

Mulege

Specimens examined: LOWER CALIFORNIA (*Gabb* 16 of 1867).

Branching from a common base, but rarely more than a dozen stems together; never so crowded as many of its allies.

64. Cereus alamosensis, sp. nov.

Cylindrical, height and habit not known, with sharp irregular ribs and a solid woody axis: areolæ prominent, about 2 cm. apart, hemispherical and densely covered with short reddish-brown wool (like pile on velvet), from which arise the ashy spines: radials 15 to 18, slender but rigid, rather unequal, radiantly spreading, straight or curved, 10 to 20 mm. long; centrals usually 4, much stouter and longer, the 3 upper erect or divergent, the lowest (usually largest and often somewhat flattened) porrect to deflexed, all more or less angular, sometimes teretish, 2.5 to 3.5 cm. long: flowers red, funnelform, about 4 cm. long: fruit unknown.—Type, Palmer 335 in Nat. Herb.

Near Alamos, Sonora.

Specimens examined: SONORA (*Palmer* 335 of 1890).

65. Cereus bradtianus, sp. nov.

Cylindrical, becoming 12 dm. high, the branches about 12 cm. long and 4 cm. in diameter: ribs 9, obtuse, slightly if at all tuberculate, with circular areolæ 10 to 15 mm. apart and bearing more or less persistent grayish tomentum: spines numerous, white and translucent, rigid and spreading in every direction; radials 15 to 18, slender, somewhat unequal, more or less radiant, 10 to 12 mm. long; centrals 5 to 7, stouter, often subangular, quite unequal (usually 1 or 2 especially prominent), 15 to 30 mm. long: flowers yellow: fruit spiny.—Type in Herb. Coulter.

Plains of Coahuila.

Specimens examined: COAHUILA (*Anna B. Nickels* of 1895).

The bright white spines on the vivid green body give the plant a striking appearance. Mrs. Nickels writes that the plant "sometimes covers a half-acre of ground, and seems to propagate by falling over on the ground and rooting all along the stem from which new plants sprout." Mrs. Nickels requests that the species be named for Mr. Géo. M. Bradt, editor of "The Southern Florist and Gardener," of Louisville, Kentucky.

66. Cereus eruca Brandegee, Pl. Baja Calif. 163 (1889).

Prostrate, stout, simple or slightly branched, 6 to 12 dm. long, 7.5 to 16 cm. in diameter, rooting from the under surface of the older growth, generally in patches of 20 to 30: ribs 13 to 21, with prominently pulvinate areolæ 4 to 15 mm. apart: spines stout, straight, ashy, stellate and interlocked; radials 1 to 3 cm. long, terete; centrals 5 to 8, stouter, angled and somewhat flattened, the lowest one much flattened (often 3 mm. wide at base), keeled beneath, longer (3 cm. or more), and strongly deflexed: flowers 10 to 12.5 cm. long, said to be yellow: fruit globular, 5 cm. in diameter, somewhat spiny, dull-red, acid and pleasant, with purple pulp: seeds very rough. (*Ill.* l. c. t. 7)—Type, Brandegee of 1889 in Herb. Brandegee.

On sandy plains along the coasts of Lower California, and on adjacent islands, but perhaps not in the Cape Region.

Specimens examined: LOWER CALIFORNIA (*Gabb* 6 of 1867, on west coast, "from Soledad to Ballenos Bay;" *Brandegee* of 1889, Magdalena Bay, also of 1890, Soledad and Todos Santos).

A plant of very curious and uncouth habit, densely covered with rigid, ash-colored interlacing spines, continually dying at the harder end and rooting on the under surface, creeping over and accommodating itself to every obstacle, often in large masses covering many square yards. Gabb says it "looks from a distance like a lot of firewood thrown at random on the ground;" and Brandegee, that "the manner of growth, with uplifted heads and prominent reflexed spines, gives the plants a resemblance to huge caterpillars." Brandegee reports it as occurring from San Gregorio to below Santa Margarita Island, and as common on Magdalena Island and about San Jorge. The local name is "chilenola" or "chirinole," and the latter appears as the specific name given to Gabb's specimens in Engelmann's manuscript notes. The fruit much resembles in form and color that of *gummosus*, the well-known "pitahaya" of Lower California.

* * *Arborescent, 3 to 18 m. high.*

\+ *Simple at base.*

67. Cereus giganteus Engelm. Emory's Rep. 159 (1848).
Pilocereus engelmannii Lem. Ill. Hort. 9, Misc. 97 (1872).

Erect, cylindrical, attenuate toward base and apex, 7.5 to 18 m. high, 3 to 6 dm. in diameter, simple, or with a few erect branches shorter than the main stem (candelabriform): ribs 12 to 15 below, 18 to 21 above, triangular, with obtusish edge and with deep triangular acute intervals, straight, often almost obliterated in older parts, and generally spineless, with prominent areolæ about 2.5 cm. apart: spines straight, very bulbous at base, lightly sulcate or subangular, white or straw-color, at length ashy (or dark); radials 11 to 17, setaceous and white, the lower and upper shorter (12 to 25 mm.), the laterals (especially the lower) stouter and longer (25 to 35 mm.), sometimes a few additional setaceous ones at upper edge; centrals 6, stout, whitish, with blackish base and reddish tip, the 4 lower ones cruciate, straight or decurved, 4 to 6 cm. long (the lowest one very long and stout and usually deflexed), the 2 upper shorter (30 to 35 mm.) and divergent upward: flowers ochroleucous or whitish, 7.5 to 12.5 cm. long, 7.5 to 10 cm. broad: fruit oval or pyriform, 6 to 7.5 cm. long and 3.5 to 5 cm. in diameter, green and reddish tinged, with crimson pulp, at length 3- or 4-valved: seeds obliquely obovate, black, smooth and shining, 1.4 to 1.8 mm. long (*Ill.* Cact. Mex. Bound. frontispiece and t. 61, 62; Rep. Bot. U. S. Dept. Agr., 1891, t. 7). Type not found in the Engelmann collection.

In rocky valleys and on mountain sides, from the middle Gila (Emory), Arizona, southward through the Lower Colorado region into Sonora (back of Guaymas).

Specimens examined: ARIZONA (*Giles* of 1850; *Thurber* 1, 689, of 1852; *Bigelow* of 1853; *Palmer* of 1867 and 1876: *Pringle* of 1881 and 1884; *Wright* of 1882; *Evans* of 1891; *Trelease* of 1892): CALIFORNIA (*Wright* 149): SONORA (*Schott* 1; *Parry* of 1852).

The best known of the arborescent forms. The young plants are globose for several years. Called "pitahaya" by the Californians; but this name seems to be applied to all large columnar *Cacti* with edible fruit. Known by the natives as "suwarrow" or "saguaro." The hard pericarp of the fruit bursts into three or four irregular valves, which spread and become recurved, and being lined with crimson pulp, look like red flowers. Preserves and molasses are made from the fruit.

The specimens of Evans from Casa Grande, Arizona, were at first thought to represent a new species, but were finally referred to *giganteus*. The ribs are 15, the spines are dark (almost black) and unusually slender, the radials 8 or 9, and the centrals 4 or 5.

68. Cereus pecten-aboriginum Engelm.; Watson, Proc. Amer. Acad. xxi, 429 (1886).

Erect, solitary, becoming 6 to 9 m. high and 3 dm. or more in diameter, with erect branches: ribs 10 or 11, with densely tomentose finally glabrate areolæ: spines 8 to 12 (mostly 10), very stout, straight, ash-color tipped with black; radials spreading or reflexed (12 mm. long or less); the solitary central (rarely 2 or 3) and sometimes the 2 uppermost radials larger (12 to 35 mm.) and erect or ascending or porrect, compressed or angular: flowers white, 5 to 7.5 cm. long: fruit globose, 6 to 7.5 cm. in diameter, dry and densely hairy and spiny: seeds 4 mm. long, black and shining.—Type, the Palmer specimens in Herb. Mo. Bot. Gard.

Stony mountain sides, from southwestern Chihuahua westward through Sonora and common throughout the Cape region of Lower California and adjacent islands.

Specimens examined: CHIHUAHUA (*Palmer* of 1885): SONORA (*Palmer* of 1869, 1874, and 1890): LOWER CALIFORNIA (*Brandegee* 244): also cultivated in Hort. Berol. in 1886, and in Kew Gard.

The plant was first made known to Dr. Engelmann by a specimen of the brushes made from the fruit, obtained by Dr. Palmer in 1869 from the Papajo Indians at Hermosillo in Sonora, and hence the specific name. The fruit is covered with stiff yellow spines and forms balls 15 cm. in diameter, often many of them growing close together and crowding the tops of the branches. The Indians, who call the plant "cardon" or "hecho," grind the seed to mix with meal, and use the bristly covering of the fruit as a hair-brush. This and *pringlei* are both known as "cardon," and form characteristic forests in the Cape region of Lower California. The *pecten-aboriginum* is more graceful than *pringlei*, has sharper ribs, and the whole plant has a purplish tinge.

69. Cereus pringlei Watson, Proc. Amer. Acad. xx, 368 (1885).

Erect, very stout, becoming 6 to 15 m. high, 6 to 12 dm. in diameter, irregularly branching above the base: ribs 13 (rarely more), with contiguous areolæ, which become spineless on older portions: spines on younger areolæ terete, the radials nearly erect, more or less unequal (12 to 18 mm.) and ash-color, the solitary central (sometimes 2 or even more) twice longer; on older areolæ about 15, dark, flattened, mostly wide-spreading, about 2.5 to 5.5 cm. long and deciduous: flowers white, tinged with green or purple, 6 to 8 cm. long: fruit globose, 5 cm. in diameter, densely tomentose and spiny: seeds obliquely oblong-ovate, black and shining, 3 mm. long.—Type, Pringle of 1884 in Herb. Gray.

Northwestern Sonora and Lower California (especially abundant in the Cape region) and adjacent islands.

Specimens examined: SONORA (*Pringle* of 1884): LOWER CALIFORNIA (*Palmer* 418, on San Pedro Island; *Brandegee* of 1889, San Gregorio, San Luis, Santa Margarita Island).

Stouter, but not so high as *giganteus*, with numerous branches starting within 6 to 9 dm. of the ground. The flowers are not clustered at summit, but are scattered along the ribs for 6 to 9 dm. below the top. The average height is about 7.5 m., with a circumference of 18 to 21 dm. below the branches. This species and *C. pecten-aboriginum* form the great "cardon" forests of Lower California. Brandegee describes one of these forests, made up chiefly of *C. pringlei*, that "covered the ground almost entirely for miles, so that when looking down upon it not even a bush is visible." The dead wood is much used for fuel and other purposes, and the seedy fruit is an article of food.

70. Cereus tetazo Weber, MSS.

Stout, branching, 10 to 15 m. high: flowers greenish-white, 6 cm. long, in clusters of 10 to 20 from the youngest areolæ and without any wool: fruit irregularly dehiscent, exposing the ripe pulp.—Type, Weber specimens in Herb. Mo. Bot. Gard.

At Zapatalan, Jalisco.

Specimens examined: JALISCO (*Weber* of 1864 and 1869).

Dr. Weber's manuscript notes are among those of Dr. Engelmann, but neither they nor the material are sufficient for any fuller diagnosis than that given above. Both Weber and Engelmann indicated their belief that this was a new species. Weber further remarks that the flowers are eaten as a salad, and the fruit is dried in large quantities. The specific name probably represents the local name. The species is closely related to if not identical with *C. pectên-aboriginum*.

71. Cereus calvus Engelm. MSS.

Erect and spreading, simple or more or less branched, the branches ascending or erect: ribs 20 or more (younger ones obtuse and almost naked), with areolæ acute at both ends, densely woolly, about 10 mm. apart and connected by a broad woolly groove: spines all erect, short (2 to 12 mm.) and sharp, irregularly arranged and numerous; radials 12 to 15, especially the upper ones weak; centrals 3 to 6, somewhat stouter and longer; all at length deciduous: flowers short, lateral near the apex: fruit globose, 2.5 cm. in diameter, loosely covered with light yellowish-red spines.—Type, Gabb 2 in Herb. Mo. Bot. Gard.

Sandy soil, from Cape San Lucas, Lower California, northward.

Specimens examined: LOWER CALIFORNIA (*Gabb* 2 of 1867).

The spines are very soon deciduous, never persisting longer than the second year, whence the popular name "cardon pelon" or "bald cereus." It may be a form of *pringlei*, and at any rate, with the next species, it forms a part of the "cardon" flora so characteristic of the Cape region of Lower California.

72. Cereus titan Engelm. MSS.

Erect, simple or more or less branched, branches ascending or erect, 6 to 15 m. high, and sometimes 6 dm. in diameter: ribs 20 or more, the younger acute, with approximate areolæ connected by a woolly groove: spines sharp and rigid, bulbous at base; radials about 12 and radiant;

centrals 3 or 4, stouter but hardly longer: flowers short, lateral toward the apex: fruit globular, large ("size of an orange"), red and armed with numerous reddish-brown spines, bursting into 4 segments when ripe.—Type, Gabb 1 in Herb. Mo. Bot. Gard.

In sandy soil, from Cape San Lucas to San Quintin, Lower California.

Specimens examined: LOWER CALIFORNIA (*Gabb* 1 of 1867).

This may be a form of *pecten-aboriginum*, but with our present information they are sufficiently kept apart. Another "cardon."

73 Cereus weberi, sp. nov.

Plant about 10 m. high, with a regular candelabra form of branching (two main branches each producing near the base two other branches, all ascending), branches and main stem of same diameter, angled and glaucous: areolæ 3 to 5 cm. apart: spines stout, bulbous at base; radials 10 or 11, 2 to 5 cm. long; central solitary, 6 to 10 cm. long, laterally compressed, sometimes a little deflexed: flowers lateral, white, 8 to 10 cm. long: fruit "as large as a small orange," covered with small scales bearing axillary wool and spines.—Type, Weber material in Herb. Mo. Bot. Gard.

"A few miles south of Tehuacan," Puebla, Mexico.

Specimens examined: PUEBLA (*Weber* of 1864).

The specific name originally proposed by Dr. Weber was *candelaber*, but there is a *Cereus candelabrius* in the European gardens, described at some time before 1840. Dr. Engelmann notes this as "a most peculiar plant." The seed is sold in market in Tehuacan, etc., and is ground and mixed with tortillas.

74. Cereus queretarensis Weber, MSS.

Tree-like, much branched, 6 to 8 m. high: flowers 10 to 12 cm. long: ovary covered with triangular fleshy scales which arise from a tubercle and bear axillary wool and spines: fruit densely covered with bunches of dark-yellowish or brownish spines bulbous at base.—Type, Weber specimens in Herb. Mo. Bot. Gard.

In the vicinity of Queretaro, Mexico, and cultivated along roadsides and fence rows.

Specimens examined: QUERETARO (*Weber* of 1864).

While our information concerning this species is scanty it may be sufficient to lead to its recognition in the original locality.

++ *Branched at base.*

++ *Spines similar.*

75. Cereus thurberi Engelm. Amer. Jour. Sci. ser. 2, xvii, 234 (1854).

Erect or ascending, fasciculate-jointed, 5 to 15 stems from same root, becoming 3 to 4.5 m. high, lower joints 6 to 9 dm. long, upper joints 15 to 18 dm. long and 10 to 15 cm. in diameter, branches curved inward: ribs 13 or 16, very slightly prominent, with shallow intervals and areolæ 25 to 30 mm. apart: spines 7 to 16, slender and rigid or almost setaceous, straight or flexuous, reddish-black at length ashy, very unequal (10 to 36 mm. in same bunch), irregularly fascicled; radials 8 to 10 (5 to

20 mm.), sometimes wanting above; centrals 3 to 6, larger and longer (2 to 3 cm.): flowers greenish-white, 6.5 to 7.5 cm. long: fruit globose, 3.5 to 7.5 cm. in diameter, spiny at length naked, olive-color with crimson pulp ("like a large orange and of delicious taste"): seeds obliquely obovate, keeled on back, shining and minutely tuberculate, 1.8 to 2 mm. long. (*Ill.* Cact. Mex. Bound. t. 74, f. 15)—Type, Thurber 2 and 367 in Herb. Mo. Bot. Gard.

From southwestern Arizona southward throughout Sonora and Lower California (especially in the Cape region).

Specimens examined: ARIZONA (*Vasey* of 1875; *Evans* of 1891, at Casa Grande): SONORA (*Thurber* 2 and 367; *Schott* 2; *Palmer* of 1869; *Pringle* of 1884): LOWER CALIFORNIA (*Gabb* 3 of 1867; *Brandegee* of 1889, Purissima and San Estaban).

The "pitahaya dulce" of the natives.

76. Cereus hollianus Weber, MSS.

Branching from base, 4 to 5 m. high and stout, dark-green: ribs 10 to 12, acute, often oblique, with areolæ 2 to 3 cm. apart: radial spines about 12, irregular, 1 to 1.5 cm. long; centrals 3, the lower one 5 to 10 cm. long and deflexed: flowers near the summit, white, 10 cm. long: fruit "as large as a goose egg," dark purplish-red, bearing wool and spines.—Type, Weber specimens in Herb. Mo. Bot. Gard.

Common about Tehuacan, Puebla.

Specimens examined: PUEBLA (*Weber* of 1864).

Important for its wood, which forms long straight rods used for poles in hedges and vineyards.

77. Cereus flexuosus Engelm. MSS.

Rather large, branched at base and straggling, the branches elongate (12 to 24 dm. and 7.5 to 10 cm. in diameter), flexuous (often deflexed), and diffusely branched: ribs 6 to 8, with deep intervals and remote areolæ: spines stout and angular, black at length ashy, annulate; radials usually 8 to 10 and radiant, 1 to 2 cm. long, the lowest slenderer; centrals 1 to 4, much stouter and erect, 2.5 to 4.5 cm. long: flower unknown: fruit globose: 2.5 to 5 cm. in diameter, dark-red and spinose, acid.—Type, Gabb 5 in Herb. Mo. Bot. Gard.

Rocky or sandy ground, from Cape San Lucas to near Rosario, Lower California.

Specimens examined: LOWER CALIFORNIA (*Gabb* 5 of 1867).

The plant is large, dark-green, and very straggling, the elongated branches arising from the base and afterward sending off lateral branchlets, often forming impenetrable thickets. The local name is "pitahaya agre."

++ ++ *Spines on fertile branches long-setaceous or hair-like.*

78. Cereus schottii Engelm. Syn. Cact. 288 (1856).

Erect or ascending, with numerous stems from the same base, often forming dense thickets, yellowish-green, 24 to 30 dm. high, with 2 to

4 joints 10 to 12.5 cm. in diameter, ascending at base and curved outward at top when mature: ribs 4 to 7 (mostly 5), with areolæ remote on sterile joints and crowded on floriferous ones: spines on sterile joints stout and short (6 to 8 mm.), consisting of 4 to 6 dusky radials and a single shorter dusky central; on floriferous joints 10 to 25, setaceous and flexuous, declinate and as if pendulous (forming a reddish-gray beard), the longer 2.5 to 10 cm.: flowers somewhat hidden in the beard, 3.5 to 4 cm. long: fruit globose, 6 to 8 mm. in diameter, with scarlet pulp: seed obliquely obovate, shining, 2 to 2.4 mm. long. (*Ill.* Cact. Mex. Bound. t. 74, f. 16)—Type, Schott 855 in Herb. Mo. Bot. Gard.

From southern Arizona to the Cape region of Lower California, Sonora, and San Luis Potosi.

Specimens examined: ARIZONA (*Schott* of 1856): SONORA (*Schott* 855; *Pringle* of 1884): LOWER CALIFORNIA (*Gabb* 7 of 1867; *Palmer* of 1870; *Brandegee* of 1889, San Gregorio and Comondu): SAN LUIS POTOSI (*Eschanzier* of 1891).

A variety of local names are reported, such as "zina," "sina," "sinita," "hombre viejo," "cabeza viejo," the latter names referring to the resemblance of the long fine white spines at the top of the plant to a gray head. Often used to make fences.

79. Cereus sargentianus Orcutt, Garden and Forest, iv, 436 (1891).

Closely related to *schottii* and possibly a form of it: stems in clumps of 8 or more, the sterile ones 6 to 15 dm. high and 5- or 6-angled, the fertile ones 30 to 45 dm. high and erect: spines on sterile stems much longer (6 to 18 mm.) and stouter, more numerous (10 or more), and areolæ closer together; the long flexuous spines of the fertile stems about 50 in a cluster: flowers 2.5 cm. long: fruit red, spineless, edible, much larger than in *schottii*. (*Ill.* l. c. 437)—Type in Herb. Orcutt.

Lower California.

Specimens examined: LOWER CALIFORNIA (*Brandegee* of 1890, Cedro).

Mr. Orcutt reports it also from San Quintin. Confused with *schottii* and called by the same local names.

The following West Indian species were examined, and are added as likely to be found in Mexico.

80. Cereus royeni armatus Otto; Salm, Cact. Hort. Dyck. 46 (1850).
Cereus armatus Otto; Pfeiff. Enum. 81 (1837).

Erect, pale-green, and scarcely glaucescent, 5 to 7.5 cm. in diameter, with 7 or 8 subcompressed ribs, broad intervals, approximate woolly areolæ, and 8 to 17 unequal, divergent, yellowish, rigid, and slender spines, 6 to 10 mm. long, in an erect-spreading cluster: flowers about 3 cm. long.

Specimens examined: CUBA (*Wright* 2621).

81. Cereus pellucidus Pfeiff. Enum. 108 (1837).

Suberect, 20 to 30 dm. high, 2.5 to 3.5 cm. in diameter, branching at base, pellucidly green, 5-angled, with younger ribs acute (almost membranaceous), older ribs obtuse and inflated below areolæ which are 8 to

10 mm. apart, straight yellow spines, of which 7 to 9 are radiant (6 to 8 mm.) and 1 central (10 to 25 mm.), and elongated flowers (17 to 20 cm.).

Specimens examined: CUBA (*Wright* 2623).

82. Cereus eriophorus Hort. Berol. in Pfeiff. Enum. 94 (1837).

Stem simple, erect and columnar (becoming 6 m. high and 3.5 cm. in diameter), tapering at summit and jointed, with 8 to 10 obtuse and repand ribs, acute intervals at length obsolete, areolæ 24 to 28 mm. apart, 9 to 12 needle-shaped white and black-tipped spines (8 to 16 mm. long), of which 8 to 10 are radial and spreading and 1 or 2 central, and large white funnel-form flowers (15 to 22.5 cm. long) with calyx-tube covered with long wool.

Specimens examined: CUBA (*Wright* 207, 2624, of 1865): also cultivated in Haege & Schmidt Gard. in 1873; and in Harv. Bot. Gard. in 1882.

ARTIFICIAL KEY TO THE SPECIES.

The following key is based upon spine characters and may be of service in case of incomplete material. Forms found within the United States are italicized; the species and varieties are indicated only by their specific or varietal names, and the numbers refer to the serial numbers of the synoptical presentation.

* *Central spines none.*

\+ *Radial spines 3 to 6 (12 to 35 mm. long).*

paucispinus (32), *triglochidiatus* (34).

\+ \+ *Radial spines 12 to 20 (2 to 12 mm. long).*

viridiflorus (1), *tubulosus* (2), *rigidissimus* (10), adustus (13).

\+ \+ \+ *Radial spines 20 to 30 (4 to 9 mm. long).*

cæspitosus (7), *castaneus* (8), *rigidissimus* (10).

* * *Central spine solitary.*

\+ *Radial spines 2 to 10.*

Radials 1 to 2 mm. long.

poselgeri (44), *greggii* (48), striatus (52), boeckmanni (59).

Radials 2 to 4 mm. long.

procumbens (43), nycticalus (56), compressus (58).

Longest radials from 6 to 10 mm.

Central spine 4 to 10 mm. long.

marginatus (46), grandiflorus (55), armatus (80).

Central spine 10 to 25 mm. long.

berlandieri (42), geometrizans (47), eburneus (54), pellucidus (81).

Longest radials from 12 to 16 mm.

aggregatus (38), napoleonis (57), pecten-aboriginum (68), tetazo (70).

Longest radials from 16 to 20 mm.

pitajaya (49), cochal (53), flexuosus (77), eriophorus (82).

Longest radials 25 to 100 mm.
Spines white.
dubius (23), *enneacanthus* (29), *mojavensis* (30), *octacanthus* (36).
Spines straw-color or yellow.
zuniensis (31), *gonacanthus* (33), *hexaedrus* (35).
Spines dusky or variegated.
fendleri (28), princeps (50), *schottii* (78), sargentianus (79).

+ + *Radial spines from 10 to 15.*

Radials 2 to 6 mm. long.
viridiflorus (1), *poselgeri* (44).
Longest radials 10 to 12 mm.
tubulosus (2), *aggregatus* (38), pecten-aboriginum (68), tetazo (70).
Longest radials 15 to 18 mm.
pringlei (69).
Longest radials 25 to 100 mm.
enneacanthus (29), weberi (73), *schottii* (78), sargentianus (79).

+ + + *Radial spines from 15 to 20.*

Longest radials 6 to 10 mm.
viridiflorus (1), spinosus (12), radians (14).
Longest radials 12 to 18 mm.
tubulosus (2), rufispinus (16).
Longest radials over 20 mm.
schottii (78), sargentianus (79).

+ + + + *Radial spines more than 20.*

emoryi (62), *schottii* (78), sargentianus (79).

* * * *Central spines 2 to 4.*

+ *Radial spines 10 or less.*

Radial spines 1 to 2 mm. long.
greggii (48).
Radial spines 4 to 12 mm. long.
aggregatus (38), maritimus (40), grandiflorus (55), flagelliformis (61).
Longest radials 16 to 20 mm.
roetteri (15), acifer (24), flaviflorus (25), cinerascens (27), pitajaya (49), *thurberi* (75), flexuosus (77), eriophorus (82).
Longest radials 25 to 30 mm.
stramineus (22), *dubius* (23), *roemeri* (37), *polyacanthus* (39).

+ + *Radial spines 10 to 15.*

Radial spines 5 to 10 mm. long.
chloranthus (3), brandegei (21), maritimus (40), pacificus (41), flagelliformis (61).
Radial spines 10 to 15 mm. long.
neo-mexicanus (5), *engelmanni* (18), *variegatus* (19), *chrysocentrus* (20), brandegei (21), *aggregatus* (38), mamillatus (63), hollianus (76).
Radial spines 15 to 20 mm. long.
roetteri (15), sanborgianus (26).
Radial spines more than 20 mm. long.
stramineus (22), *roemeri* (37), *polyacanthus* (39).

+ + + *Radial spines 15 to 20.*

Radial spines 5 to 10 mm. long.
chloranthus (3), *ctenoides* (6), pectinatus (9), *centralis* (11), brandegei (21).

Radial spines 10 to 20 mm. long.
dasyacanthus (4), brandegei (21), mamillatus (63), **alamosensis** (64).

\+ + + + *Radial spines more than 20.*

dasyacanthus (4), *ctenoides* (6), mamillatus (63).

* * * * *Central spines more than 4.*

\+ *Radial spines 10 or less.*

roetteri (15), *roemeri* (37), maritimus (40), *thurberi* (75).

\+ + *Radial spines 10 to 15.*

Radial spines 5 to 10 mm. long.
chloranthus (3), maritimus (40), pacificus (41).
Radial spines 10 to 20 mm. long.
roetteri (15), sanborgianus (26), gummosus (60).
Radial spines more than 20 mm. long.
roemeri (37), *giganteus* (67).

\+ + + *Radial spines 15 to 20.*

Radial spines 5 to 10 mm. long.
chloranthus (3), pectinatus (9), *centralis* (11).
Radial spines 10 to 15 mm. long.
dasyacanthus (4), longisetus (17), bradtianus (65).
Radial spines more than 20 mm. long.
giganteus (67).

\+ + + + *Radial spines more than 20.*

dasyacanthus (4), eruca (66).

GEOGRAPHICAL DISTRIBUTION.

So far as now known there are twenty-nine species of the genus *Cereus* represented within the borders of the United States, one of which is a West Indian form extending into Florida, and ten are peculiar to our flora. The genus is a very large and diversified one in Mexico, ranging in habit from small globose forms through cylindrical ones and climbers to the huge arborescent forms of the "cardon" forests of Sonora and Lower California. In the United States the genus is not represented north of the mountains of southern Wyoming or east of Indian Territory, except in the case of the Florida species referred to. As in the case of the genera already considered, our species appear but as outliers of the large Mexican flora. So uncertain is our knowledge of the latter that no attempt is made to include its species in this discussion.

Omitting *monoclonos*, a West Indian species of EUCEREUS which occurs in Florida, the two great groups of the genus are represented in the United States by twenty-eight species, twenty-three belonging to ECHINOCEREUS, and five to EUCEREUS. The EUCEREUS group is

eminently Sonoran, and its arborescent forms, three in number (*gigan-teus*, *thurberi*, and *schottii*), are strictly confined to the desert region of the Lower Colorado, chiefly upon the Arizona side in the region of the Gila River; but they are merely the northern representatives of the large display of giant forms found in Sonora and Lower California. Of the nonarborescent forms of EUCEREUS, but two are included in our flora, one (*emoryi*) being a Lower Californian type extending into southern California, and the other (*greggii*) a Sonoran and Chihuahuan type extending into Arizona and as far east as the Pecos River in Texas, by far the most eastern of our EUCEREI. It will be seen that there are no species of EUCEREUS peculiar to the United States.

The relatively larger display of the ECHINOCEREI in the United States is probably to be partially explained by their low compact forms, simulating in a perplexing way those of *Cactus* and *Echinocactus*. Out of the twenty-three species of our flora but two are really cylindrical, one (*poselgeri*) a form occurring on both sides of the Lower Rio Grande and so weak and slender that it uses shrubs for a support; the other (*berlandieri*) also a form of southeastern Texas, originally found on the Nueces, apparently peculiar to the United States, and with its short cylindrical body forming a transition between the cylindrical and more compact forms. The remaining twenty-one species form our dominant *Cereus* flora, and of these but nine are peculiar, so far as now known, to the United States. These twenty-one species are easily thrown into three groups: (1) the pectinate forms; (2) the purple-flowered nonpectinate forms; and (3) the scarlet-flowered nonpectinate forms. The first contains seven species, the second six species, the third eight species.

The pectinate forms are characteristically eastern in their display and have the greatest northern extension, *viridiflorus* reaching the mountains of southern Wyoming. Their Mexican origin is also more in the direction of Coahuila and Chihuahua than of Sonora. Of the seven species represented, three are peculiar to the United States (*viridiflorus*, *chloranthus*, and *dasyacanthus*). Of these three forms only *viridiflorus* has a northern range, extending from the mountains of southern Wyoming through Colorado to the borders of eastern New Mexico and northwestern Texas, but it is represented in the El Paso region by its cylindrical variety, *tubulosus*. In the case of the two other species, *chloranthus* has a very restricted range, being confined to the El Paso region, while *dasyacanthus*, occurring in the same region, extends westward to Arizona. It is more than probable that both of these species will be found in Mexico. The closely associated *ctenoides* is also a form of southwestern Texas, which has come from Coahuila and Chihuahua. Another species of Chihuahuan origin, occurring in the El Paso region but extending westward to Arizona, is *roetteri*. The strongest pectinate type, however, is exhibited by the species *pectinatus*, which is common to Chihuahua and Sonora, but is repre-

sented in our flora by its variety *rigidissimus*, one of the most common of Arizona forms and extending to southwestern Texas, and the variety *centralis*, also an Arizona form. This same *pectinatus* type is represented at the east by *cæspitosus*, the most eastern of our CEREI, reaching the Canadian and Arkansas Rivers in Indian Territory, and apparently not occurring west of the Pecos, its Mexican extension being in the States east of Chihuahua.

The purple-flowered nonpectinate species, six in number, range from the Salt Lake Desert of Utah on the north to the eastern slopes of the Californian Sierras and the middle Rio Grande on the south, their Mexican connections extending from Lower California to Coahuila. But one of them (*mojavensis*) is peculiar to our flora, occurring in the desert regions of southeastern California, Arizona, and southern Utah. Four of the species reach Texas: *dubius* in the Rio Grande bottoms from El Paso downward, with no western extension, but with a Mexican extension into Chihuahua and Coahuila; *enneacanthus* all along the Lower Rio Grande and to El Paso, with a similar Mexican extension, but reaching Arizona on the west; *stramineus*, common in the Pecos and El Paso region, extending down the Rio Grande, west to Arizona, and south into Coahuila; and *fendleri*, a Sonoran and Chihuahuan type, which stretches through Arizona to Utah and east to southwestern Texas. The dominant species of the group, however, *engelmanni*, is far western in its distribution, extending from Lower California and Sonora along the eastern slopes of the Californian Sierras and through Arizona and Nevada to the Salt Lake Desert of Utah. Two strong varieties of this species are peculiar to our flora: *variegatus*, occurring with the species within our borders, and *chrysocentrus*, confined to the deserts of southeastern California.

The scarlet-flowered nonpectinate species, eight in number, contain five peculiar to our flora, but these five are species of no great abundance, and one of them (*hexaedrus*) has never been rediscovered. The three remaining species, which are the dominant ones, are all common to the Chihuahua region, and extend from the El Paso region to southern California. Of the five species restricted to the United States, *gonacanthus* is the most northern and the most removed from the Mexican flora, occurring in southern Colorado and northern New Mexico; *hexaedrus* is the least known, having been found but once, and then near Zuni, New Mexico; *paucispinus* inhabits the narrow belt between the San Pedro and Pecos rivers of Texas, a range, however, which specimens recently received from Durango, Colorado, will modify; *triglochidiatus* ranges from east of the Pecos in Texas northward into New Mexico; while *octacanthus* has the most extended range, reaching from the El Paso and Pecos region of Texas northwestward through New Mexico into Utah. The three species of wide range and Mexican representation are: *aggregatus*, extending from southern Colorado through eastern Arizona and southwestern Texas to San Luis Potosi; *roemeri*,

ranging from the Upper Pecos in New Mexico to southern California, and extending southward into Chihuahua; and *polyacanthus*, most abundant of all the group, extending from El Paso to southern California and southward into the mountains of Chihuahua on the east and Lower California on the west.

Taking our species of *Cereus* as as a whole, therefore, they may be broadly thrown into two geographical groups, the El Paso forms and the Arizona forms, the former, containing about two-thirds of the species, and of Chihuahua origin, the latter of Sonoran origin.

6. OPUNTIA Mill. Gard. Dict. ed. 7 (1759).

Plants with flat or cylindrical more or less tuberculate joints: leaves conspicuous but caducous, each with an axillary "pulvinus" which is usually clothed with soft wool intermixed with barbed bristles at the upper edge and usually bearing spines at the lower edge: flowers developed from the bristle-bearing part of the pulvinus, with rotate corollas: ovary covered with the caducous leaves bearing axillary wool and often bristles and spines: fruit dry or succulent: seeds large, usually flattened and discoid, often margined: cotyledons foliaceous, curved about the endosperm. *Consolea* Lem. (1862); *Tephrocactus* Lem. (1868); *Ficindica* St. Lag. (1880).

The most difficult of our genera on account of its exceedingly ill-defined specific lines. Little more is attempted in the following pages than a tentative presentation of our material, and little more can be done until numerous forms have been studied under cultivation.

I. PLATOPUNTIA. *Joints flat, more or less round: spines never sheathed: seeds with prominent margin.*

* *Petals small, subulate, suberect: stigmas 1 to 3, acute.*

1. Opuntia stenopetala Engelm. Syn. Cact. 289 (1856).

Prostrate, with large thick joints 15 to 20 cm. broad: pulvini 3 to 3.5 cm. apart on surface of joint, but very crowded at margin, with much dirty-white wool and short dark-brown bristles: spines 1 to 3 (often with 1 to 3 smaller ones added), 3.5 to 5 cm. long, curved deflexed or spreading, compressed, reddish-black with lighter tip: flowers orange, its pulvini very woolly: sepals and petals numerous, linear-subulate and suberect: style undivided at apex: ovary 18 mm. long: fruit unknown. (*Ill.* Cact. Mex. Bound. t. 66)—Type, Gregg 295 in Herb. Mo. Bot. Gard.

"Battlefield of Buena Vista, south of Saltillo" (Gregg).

Specimens examined: COAHUILA (*Gregg* 295 of 1848; *Weber* of 1865–1866).

The Mexican *O. grandis* has similar flowers, but is an erect plant, with few white spines and two or three acute stigmas.

** *Petals broad, obovate or obcordate: stigmas usually 5 to 10, obtuse.*

– *Fruit succulent: margin of seed mostly narrow.*

-- *Joints glabrous.*

(1) *Suberect: spines numerous, colored: fruit small, subglobose.*

2. Opuntia strigil Engelm. Syn. Cact. 290 (1856).

Suberect, pale-green, about 6 dm. high, with the obtuse or subacute joints ovate, obovate, or orbicular, 10 to 12.5 cm. long and 8.5 to 10 cm. broad: pulvini prominent, crowded (8 to 12 mm. apart), whitish-woolly when young, soon with pale-yellow bristles, all spiniferous: spines 5 to 8, radiant, red or reddish-brown, yellowish toward tip, 6 to 16 mm. long, toward margin of joint, with 1 or 2 stouter longer (nearly 2.5 cm.) erect, spreading, or deflexed ones (deep-brown to light reddish-brown to yellow): fruit subglobose, about 12 mm. in diameter, red: seeds thick, obtusely and narrowly margined, 3 mm. in diameter. (*Ill.* Cact. Mex. Bound. t. 67)—Type, Wright 374 in Herb. Mo. Bot. Gard.

In crevices of limestone rocks, between the Pecos and El Paso, Texas.

Specimens examined: TEXAS (*Wright* 374 of 1851, 1852; *Nealley* of 1891).

(2) *Erect or procumbent: joints large: spines (when present) few, stout, compressed, mostly colored: fruit large, mostly ovate.*

A. Unarmed.

3. Opuntia ficus-indica (L.) Mill. Dict. ed. 8, no. 2 (1768).
Cactus ficus-indicus L. Sp. Pl. i, 468 (1753).

Erect and proliferous, 12 to 18 dm. high, with cylindrical trunk which becomes woody with age: joints thickish, elliptical or obovate, 10 to 45 cm. long: pulvini immersed, distant, not spinose or rarely with a minute solitary spine: flowers yellow, 7.5 to 10 cm. in diameter: fruit bristly, obovate, red within, edible.—Type unknown.

Throughout the West Indies (extending into southern Florida) and Tropical America, and cultivated south of the Rio Grande under the name "nopal castillano."

Specimens examined: CUBA (*Wright*, 1860–64): CANARY ISLANDS (*Bourgeau* 1239).

Probably the most ancient cactus in gardens. In the Kew Index it is suggested that this species is identical with *O. tuna*, which seems to be very probable.

4. Opuntia lævis, sp. nov.

Joints light-green, elongate-obovate, 30 cm. long and 10 cm. wide, gradually narrowed below, obtusely pointed above: pulvini small, oval (3 to 4 mm. long), 2.5 to 3.5 cm. apart, gray-tomentose, with numerous short pale bristles, unarmed: flowers yellow, tinged with red, about 6 cm. broad: stigmas slender, 8: fruit somewhat pyriform, 5 to 6 cm. long, deeply umbilicate, bearing about 40 pulvilli: seed very irregular, 4 to 5 mm. in diameter, with thick acute undulate margin.—Type, Pringle of 1881 (distributed as *O. angustata*) in Herb. Coulter.

Arizona.

Specimens examined: ARIZONA (*Pringle* of 1881; *Palmer* 93, 95; *Coues & Palmer* 247; *Vasey* 247).

Besides the spineless character, the seeds are about half as large as those of *O. angustata*, to which species it has been referred.

B. Spines yellow (sometimes red in O. lindheimeri).

i. *Stem erect.*

5. Opuntia tuna (L.) Mill. Dict. ed. 8, no. 3 (1768).
Cactus tuna L. Sp. Pl. i, 468 (1753).
Opuntia bonplandii H. B. K. Nov. Gen. & Sp. vi, 69 (1823).

Erect and proliferous, 9 to 12 dm. high, with oval or elliptical joints 10 to 20 cm. long: pulvini distant, with a grayish tomentum, bearing above a fascicle of brownish-yellow bristles and below 4 to 6 rigid stout or subulate unequal spreading yellow spines (longest 2.5 to 3.5 cm. long): flowers yellow or reddish-yellow, 7.5 to 10 cm. in diameter: fruit somewhat pyriform, large and edible.—Type unknown.

Throughout tropical America, and extensively cultivated.

Specimens examined: FLORIDA KEYS (*Binmar; Canby* of 1869): CUBA (*Wright* of 1860–64): SAN LUIS POTOSI (*Parry & Palmer* 279; *Webber* of 1866): VERA CRUZ (*Parry* of 1877): NICARAGUA (*Wright* of 1853–56): PANAMA (*Schott* 3): CANARY ISLANDS (*Bourgeau* 263): also specimens cultivated in Mo. Bot. Gard. in 1862, 1870, 1876, and growing in 1893; also specimens from South Carolina (*Tourney* of 1846; *Mellichamp* of 1871), presumably cultivated; also Hort. Vindob. 837.

This species is so extensively cultivated and naturalized that it seems impossible to define its natural range. In Southern California it is cultivated for fences and naturalized about the old missions, where it is called "tuña." In Lower California and Mexico it is also extensively cultivated.

6. Opuntia triacantha (Willd.) DC. Prodr. iii, 473 (1828), not Sweet, Hort. Brit. 172 (1827).
Cactus triacanthos Willd. Enum. Suppl. 34 (1813).

Erect and proliferous, with oval to oblong joints: pulvini somewhat crowded, with yellowish bristles and usually 3 (4 to 1) stiff divaricate spreading or reflexed whitish spines, the upper 3 to 5 cm. long, often twice as long as the two lower ones: flowers reddish, 2.5 cm. in diameter.—Type unknown.

Throughout Tropical America.

Specimens examined: CUBA (*Wright* 1860–64): ANTIGUA (*Wullschlogel* of 1849): cultivated in Hort. Modena.

The spines of this species are much weaker (as well as fewer) than those of *O. tuna*. According to the Kew Index *O. triacantha* Sweet[1] is *O. curassavica* Mill.,[2] a south Mexican and South American plant, which we have not seen, but which is certainly not the species described above.

7. Opuntia lindheimeri Engelm. Pl. Lindh. 207 (Jan. 1850).
Opuntia engelmanni Salm, Cact. Hort. Dyck. 235 (1850).

Erect, 12 to 18 dm. high, with a stem at length woody and terete (15 cm. in diameter) bearing a grayish cracked and unarmed bark, and large pale-green obovate or orbicular-obovate joints (in larger specimens 30 cm. long by 22.5 cm. broad): pulvini remote (3 to 3.5 cm. apart), with sparse yellow rigid strongly unequal bristles, and few spines (in upper pulvini mostly two or three) 2.5 to 3.5 cm. long, strongly

[1] Hort. Brit. ed. 1, 172.

[2] Gard. Dict. ed. 8, no. 7.

compressed or angular, straight or curved deflexed or variously divergent, straw-colored or horny, with reddish base or entirely red, and one or two additional lower ones 1.2 to 1.8 cm. long (slenderer, paler, often wanting): flowers yellow, red within, 6 to 7.5 cm. broad: fruit obovoid-globose (rarely pyriform), 5 cm. long and 3.5 cm. broad, purplish, with bright-purplish insipid or nauseous pulp: seeds somewhat irregular, mostly narrow-margined, 3 to 4 mm. in diameter. (*Ill.* Cact. Mex. Bound. t. 75, f. 1–4)—Type, Lindheimer 1722 of 1845 in Herb. Mo. Bot. Gard.

Along the whole Mexican border, from the Canadian River and mouth of the Rio Grande to the Pacific and adjacent islands, and southward into Chihuahua and Coahuila.

Specimens examined: TEXAS (*Lindheimer* 1722 of 1845; *Wright* 329, 437, 473, of 1852; *Bigelow* 117 of 1852; *Tweedy* of 1880): NEW MEXICO (*Bigelow* 91; *Evans* of 1891, Lordsburg; *Mearns* of 1892, Grant Co.): ARIZONA (*Palmer* 81, 95, 477; *Rusby* of 1883, Oak Creek; *Evans* of 1891, Tucson; *Toumey* of 1892, Tucson): CALIFORNIA (*Wislizenus* 223; *Rothrock* 10, Santa Cruz Island; *G. R. Vasey* of 1880, San Bernardino): COAHUILA ("St. Louis Volunteers" of 1846): also cult. in Mo. Bot. Gard. 1853, 1861, 1862, and growing in 1893.

A stout, coarse looking plant of wide range and variation. This and apparently all other Platyopuntias are indiscriminately spoken of as "nopal" and "tuna," the former name being applied to the joint, the latter to the fruit. The spines are variously colored, being frequently a deep-red, or entirely white, or variegated. Evans's specimens from Lordsburg not only have deep-red spines, but also ovate joints. The four following forms have been suggested as varieties, and they may prove constant enough.

8. Opuntia lindheimeri dulcis (Engelm.).

Opuntia dulcis Engelm. Cact. Mex. Bound. 48 (1856).

Lower (6 dm. high) and more spreading, with smaller joints (15 cm. long), very numerous bristles, mostly twisted deflexed pale (almost white) spines, ovate sweet fruit, and smaller regular seeds. (*Ill.* Cact. Mex. Bound. t. 75, f. 5–7)—Type, Mexican boundary collections of Bigelow and Wright in Herb. Mo. Bot. Gard.

Along the middle Rio Grande, near Presidio del Norte, etc.

Specimens examined: TEXAS (*Bigelow* of 1852–54; *Wright* of 1852): also growing in Mo. Bot. Gard. 1893.

9. Opuntia lindheimeri occidentalis (Engelm.).

Opuntia occidentalis Engelm. & Bigel. Pacif. R. Rep. iv, 38 (1856).

Opuntia engelmanni occidentalis Engelm. Pacif. R. Rep. iv, errata, iii (1856).

Erect and spreading, 12 dm. high, forming large thickets, with joints as large as in the species, pulvini more remote and with very fine close-set bristles, one to three white (dusky at base) deflexed or divergent spines, very juicy but sour fruit, and larger (5 to 6 mm. broad) seeds with crenulate margins. (*Ill.* Pacif. R. Rep. iv, t. 7, f. 1, 2; t. 22, f. 10)—Type, Schott of 1854 and 1855 in Herb. Mo. Bot. Gard.

Very abundant in southern California west of the coast mountains; also found near Laredo, Texas.

Specimens examined: CALIFORNIA (*Schott* of 1854 and 1855; *Engelmann* of 1880; *Nevin* of 1881): TEXAS (*Nealley* of 1891, at Laredo): also cult. at Mo. Bot. Gard. 1876, and growing 1893.

Dr. Merriam reports this variety as abundant throughout the San Bernardino plain, and immense patches of it 40 miles east of Los Angeles. The habit of growth, very fine bristles, and larger seed serve to distinguish it from the species.

10. Opuntia lindheimeri cyclodes (Engelm.).

Opuntia engelmanni cyclodes Engelm. Syn. Cact. 291 (1856).

About 12 dm. high, with orbicular joints 15 to 18 cm. in diameter, mostly solitary straw-colored (dusky at base) straight and deflexed spines, small globose fruit 2.5 to 3.5 cm. in diameter, and seeds 4 to 5 mm. broad with broadly undulate thickish margins. (*Ill.* Pacif. R. Rep. iv, t. 8, f. 1; t. 22, f. 8, 9)—The type could not be found in the Engelmann collection.

From El Paso, Texas, to the Upper Pecos and Stein's Pass in New Mexico.

Specimens examined: NEW MEXICO (*Evans* of 1891, Stein's Pass): TEXAS (*Evans* of 1891, El Paso).

11. Opuntia lindheimeri littoralis (Engelm.).

Opuntia engelmanni littoralis Engelm. Bot. Calif. i, 248 (1876).

Joints often larger (3 to 4.5 dm. long), with pulvini closer together, longer and more slender spines, and smaller seeds.—Type, Tittum and Mallinckrodt of 1874 in Herb. Mo. Bot. Gard.

Coast of southern California and the adjacent islands (reported from San Miguel, Santa Rosa, Santa Cruz, and Santa Catalina).

Specimens examined: CALIFORNIAN ISLANDS (*Tittum & Mallinckrodt* of 1874; *Rothrock* of 1875, Santa Cruz).

12. Opuntia chlorotica Engelm. Syn. Cact. 291 (1856).

Opuntia tidballii Bigel. Pacif. R. Rep. iv, 11 (1856), *nomen nudum.*

Erect, 12 to 21 dm. high, forming large bushes, with stems at length woody and terete with scaly grayish or light-brown bark and completely covered with very numerous straw-colored bristles and yellow spines; joints orbicular-obovate, pale glaucous, 15 to 20 cm. long and 20 to 25 cm. broad: pulvini about 2.5 cm. apart, with very numerous unequal bristles, and 3 to 6 (1 to 3 in lower pulvini) unequal angular pale straw-colored mostly deflexed spines 2.5 to 5 cm. long (the interior shorter and erect, 8 to 18 mm. long): flowers yellow, 5 to 7.5 cm. broad: fruit large (about 4 cm. long), ovate: seeds small (2.5 by 3.5 mm.), whitish, subreniform, thick, with obtuse margin. (*Ill.* Pacif. R. R. iv, t. 6, f. 1–3)—Type, Bigelow of 1853 and 1854 in Herb. Mo. Bot. Gard.

Western Arizona and southeastern California, and extending into the Charleston Mountains, Nevada.

Specimens examined: ARIZONA (*Bigelow* of 1853 and 1854; *Palmer* of 1877): CALIFORNIA (*Bigelow* of 1854; *Parish* 1419, San Felipe).

The species is readily recognized by the very spiny trunk and very pale broad joints. The large and sometimes spreading bushes often bear 100 or more joints

The arrangement of the bristles is somewhat peculiar, the upper and outer ones (by far the more numerous) being shorter and thinner and covering the upper part of the areola, and within these a semicircular row of stouter and longer bristles, which join the outer and shorter spines of the outer and lower margin of the areola.

13. Opuntia tapona Engelm. MSS.

Joints obovate, 20 to 25 cm. long: pulvini about 5 cm. apart, with short marginal bristles and 2 (rarely more) pale rather stout compressed spines 1 to 1.5 cm. long: fruit elongated clavate, stipitate, densely tuberculate, dark-purple, 5 to 6 cm. long, sterile so far as seen.—Type, Gabb 20a in Herb. Mo. Bot. Gard.

Sandy soil, especially southward in Lower California.

Specimens examined: LOWER CALIFORNIA (*Wm. M. Gabb* 20a, in 1867, near Loreto).

The name refers to a fancied resemblance of the fruit to a bottle-stopper (*tapone*).

14. Opuntia larreyi Weber, MSS.

Plant only 9 to 12 dm. high, with large orbicular glaucous joints: fruit "as large as a goose egg," juicy, purple, and with purple pulp: seeds small, "much like those of *O. ficus-indica*."—Type unknown.

A Mexican species, found by Dr. Weber in cultivation about Queretaro, and pronounced by him the most delicious of all the fruits he had tasted. Known as "camuessa."

15. Opuntia palmeri Engelm. MSS.

Joints oval, smooth (not tuberculated), pale glaucous, 20 to 25 cm. long by 15 to 20 cm. broad: pulvini 2.5 to 3 cm. apart, with pale brownish or gray persistent wool, a few very slender straw-colored bristles, and slender flattened or compressed straw-colored spines 2.5 to 3 cm. long (5 to 7 on upper pulvini with some smaller additional ones, 1 to 3 on lower pulvini), erect or spreading, or the upper ones (from upper part of pulvinus) mostly deflexed.—Type, Palmer of 1877, in Herb. Mo. Bot. Gard.

Near St. George, Utah.

Specimens examined: UTAH (*Palmer* of June, 1877).

16. Opuntia pycnantha Engelm. MSS.

Erect, with ovate-orbicular compressed scarcely tuberculate joints 12.5 to 15 cm. long by 12.5 cm. wide, armed with densely interwoven mostly deflexed spines: pulvini approximate (6 to 8 mm. apart), with fulvous wool (becoming dusky), and weak bristles (at length elongated and very numerous): spines in younger joints 3–7, pale straw-color (at length ashy), 6 to 25 mm. long, all deflexed; in older joints more numerous (as many as 20), longer and more rigid; flowers and fruit unknown.—Type, Agassiz of 1872 in Herb. Mo. Bot. Gard.

Magdalena Bay, Lower California.

Specimens examined: LOWER CALIFORNIA (*Prof. L. Agassiz*, Magdalena Bay, collected on the Hopler expedition in 1872; *Brandegee* of 1889, Magdalena Island).

The above description was drawn up by Dr. Engelmann from the Agassiz material. Brandegee's specimens supply a good joint, a flower, and ripe fruit, enabling me to supplement the description. The joint is 22 by 14 cm., the pulvini very large and prominent and close together, sometimes even in contact. The fulvous wool gradually becomes darker until it is black, and encircling it above there is usually a more or less prominent tuft of bright-yellow bristles. The single withered flower is small and greenish yellow. The fruit is evidently juicy, globose or obovoid, strongly tuberculate, closely set with the pulvini bearing dark wool, and yellow bristles and spines, about 4.5 cm. in diameter. The seeds are discoid and beaked, somewhat irregular, with thick margin, 3 to 3.5 mm. broad. The spines are terete.

17. Opuntia pycnantha margaritana, var. nov.

Pulvini not so prominent, with more grayish wool, reddish bristles, dark-red more rigid and more or less angular and compressed spines.—Type in Herb. Brandegee.

Santa Margarita Island.

Specimens examined: LOWER CALIFORNIA (*Brandegee* of 1889).

Mr. Brandegee also notes that the flowers are red.

ii. *Stem procumbent.*

18. Opuntia procumbens Engelm. Syn. Cact. 292 (1856).

Prostrate, with the large pale-green orbicular-obovate joints always on edge, 15 to 30 cm. long by 15 to 22 cm. broad: pulvini 2.5 to 5 cm. apart, with long (3 cm.) tomentum, yellow rigid strongly unequal bristles, and 2 to 5 (sometimes 7 to 9) compressed-angular unequal deflexed spines 1 to 5 cm. long (lower ones shortest) and straw-color or paler, darker towards the base, often reddish or reddish-brown: fruit ovate, 3.5 cm. long: seeds 3 to 4 mm. in diameter, with broad irregular margins. (*Ill.* Pacif. R. Rep. iv, t. 7, f. 4, 5).—Type, Bigelow of 1854 in Herb. Mo. Bot. Gard.

In rocky places, from El Paso, Texas, to northwestern Arizona.

Specimens examined: ARIZONA (*Bigelow* of 1854): TEXAS (*Evans* of 1891, El Paso).

The original Arizona range is "from the San Francisco Mountains to Cactus Pass at head of Bill Williams River." The El Paso specimens are smaller than the more western ones, but otherwise there seems to be no difference.

19. Opuntia rubrifolia Engelm. MSS.

Prostrate, with thick ovate joints 12 to 15 cm. long by 10 cm. broad, not tuberculated: leaves spreading, somewhat recurved, reddish, 8 to 10 mm. long: pulvini 2 to 2.5 cm. apart, with brownish-gray persistent wool and numerous yellowish bristles (especially on the upper edge): spines at lower edge of pulvinus, mostly 2 or 3, slender, angular, and often twisted, 2.5 to 6 cm. long, often a few additional smaller ones, all deflexed (almost appressed): flowers and fruit unknown.—Type, Palmer 3 in Herb. Mo. Bot. Gard.

St. George, Utah.

Specimens examined: UTAH (*Palmer* 3).

20. Opuntia angustata Engelm. Syn. Cact. 292 (1856).

Prostrate or ascending, with elongated obovate joints (narrowed toward the base and rounded above) 15 to 25 cm. long or more and 7.5 to 10 cm. broad: pulvini over 2.5 cm. apart, with grayish wool, slender yellowish-brown bristles, and 2 or 3 (often 1 or 2 weaker ones added below) stout angular deflexed spines 2.5 to 5 cm. long, straw-colored or white, yellow or red toward the base: fruit obovate subglobose, broadly and deeply umbilicate, tuberculate and bristly, reddish, 2.5 to 3.5 cm. long: seeds about regular, with broad almost curled margins, 6 mm. or more in diameter. (*Ill.* Pacif. R. Rep. iv, t. 7, f. 3, 4; t. 22, f. 11)—Type, the Bigelow specimens in Herb. Mo. Bot. Gard.

From New Mexico to the mountains of southern California.

Specimens examined: NEW MEXICO (*Bigelow* of 1853): ARIZONA (*Bigelow* of 1854): CALIFORNIA (*Bigelow* of 1854).

21. Opuntia angustata comonduensis, var. nov.

Joints semiobovate (one side straight, as if an obovate joint had been divided in the median line), tapering below as in the species, but with greatest diameter near the middle and tapering above, 20 cm. long, 4.5 to 7.5 cm. broad: spines terete: flower 5 cm. long, yellowish, with reddish tinge outside: fruit at last neither tuberculate nor spiny, but with prominent woolly and bristly pulvini, pyriform, about 4 cm. long: seeds smaller, 3.5 to 4 mm. broad.—Type in Herb. Brandegee.

Comondu, Lower California.

Specimens examined: LOWER CALIFORNIA (*Brandegee* of 1889).

The spines are most prominent along the curved margin and above, some pulvini becoming spineless, until in one specimen the whole joint is unarmed except a few pulvini. In his discussion of *angustata*[1] Dr. Engelmann remarks that while specimens east of the Colorado have sharply angular spines, the one that he had from the California mountains had spines not so angular, and some of them were almost terete. This Lower Californian variety has all the spines distinctly terete. As Dr. Engelmann's description of the fruit was drawn from a single specimen, it is probable that there was no evidence that the tubercles eventually disappeared.

C. Spines reddish or blackish.

22. Opuntia macrocentra Engelm. Syn. Cact. 292 (1856).

Ascending, 6 to 9 dm. high, with large suborbicular thin often purplish joints 12.5 to 20 cm. long and 10 to 17.5 cm. broad: pulvini 2 to 2.5 cm. apart, with grayish wool, slender short yellow bristles, uppermost and marginal ones alone armed, the lower without spines: spines 1 or 2 (rarely more), 5 to 7.5 cm. long, straight or variously flexed, reddish-black, paler upward, often annulate, upper terete, lower a little shorter and compressed or channelled: flowers yellow, 7.5 cm. broad: fruit ovate, 3 cm. long: seeds much twisted, 4 to 4.5 mm. broad, broadly and obtusely undulate margined. (*Ill.* Cact. Mex. Bound. t. 75, f. 8)—Type, the Wright specimens in Herb. Mo. Bot. Gard.

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[1] Pacif. R. Rep., iv [pt. 1], 39.

Sandy ridges in southwestern Texas to Arizona and extending southward into Chihuahua.

Specimens examined: TEXAS (*Wright* of 1851–52; *G. R. Vasey* of 1881, El Paso; *Evans* of 1891, Sierra Blanca; *Trelease* of 1892; *Woodward*): NEW MEXICO (*Evans* of 1891, Lordsburgh): ARIZONA (*Wilcox* of 1894, Fort Huachuca): CHIHUAHUA (*Pringle* 235, a spineless form distributed as *O. rufida*).

The thin joints and long nearly black spines characterize the species. The Chihuahuan specimen of Pringle is spineless and has smaller pinkish flowers (5 cm. broad); however, spiny and spineless joints are sometimes found on the same plant. Vasey's material has spines more grayish than usual and bristles more reddish-brown, being unusually suggestive of *mesacantha*.

23. Opuntia phæacantha Engelm. Pl. Fendl. 51 (1849).
Opuntia phæacantha nigricans Engelm. Syn. Cact. 293 (1856).
Opuntia phæacantha brunnea Engelm. l. c.

Diffuse, ascending, with obovate thick glaucous or sometimes purplish joints 10 to 17.5 cm. long and 6 to 11 cm. broad: pulvini 2.5 to 3.5 cm. apart, with grayish wool and slender yellowish or brownish bristles, mostly armed: spines 2 to 5, straight, reddish-brown to blackish, paler upwards, 2.5 to 6 cm. long, the upper one teretish and porrect, the rest shorter, unequal, more or less angular or compressed, deflexed: fruit cuneate-pyriform, much contracted at base, with a broad and shallow umbilicus, scarcely pulpy, 3 to 3.5 cm. long: seeds very variable, 4 mm. broad or smaller. (*Ill.* Cact. Mex. Bound. t. 75, f. 9–15)—Type, the Fendler specimens in Herb. Mo. Bot. Gard.

Sandy ridges from the El Paso region of Texas to the Rio Grande, near Santa Fe, New Mexico, and eastern Arizona, and southward into Chihuahua.

Specimens examined: NEW MEXICO (*Fendler* of 1846–47, along Rio Grande near Santa Fe): ARIZONA (*Parry* of 1867): TEXAS (*Wright* of 1851–52, in valley near El Paso; *Evans* of 1891, in same locality): CHIHUAHUA (*Wislizenus* 249).

The flowers described in Pl. Fendl. and subsequent writings as those of this species prove not to belong here. In Watson's Biblographical Index *O. polyantha* Haw. (*Cactus polyanthus* Sims) is referred here. In the Missouri Botanical Garden in 1893 there were growing plants of *polyantha* from South America, evidently that species as figured in the Botanical Magazine,[1] and not at all our *phæacantha*. *O. polyantha* much more resembles *O. tuna*.

24. Opuntia phæacantha major Engelm. Syn. Cact. 273 (1856).

Joints much larger, 12.5 to 15 cm. and even 20 cm. broad, with more remote pulvini, and shorter fewer paler spines.—Type, Fendler of 1846 in Herb. Mo. Bot. Gard.

Mountains near Santa Fe, New Mexico.

Specimens examined: NEW MEXICO (*Fendler* of 1846; *Bigelow* of 1853).

This variety is characterized in Plantæ Fendlerianæ, but without name.

[1] liii, t. 2691.

25. Opuntia camanchica Engelm. Syn. Cact. 291 (1856).

Prostrate and extensively spreading, with ascending obovate-orbicular joints 15 to 17.5 cm. long by 13.5 to 17.5 cm. broad: pulvini about 3 cm. apart, with few greenish or yellowish-brown bristles, mostly armed: spines 1 to 3 (or marginal ones 3 to 6), compressed, reddish-brown to blackish-brown, paler at tip, 3.5 to 7.5 cm. long, the upper one elongated and suberect, the rest deflexed: fruit oval, with broad umbilicus, deep red, sweet and juicy, 3.5 to 5 cm. long: seeds angular, with broad thick acute or obtuse margins and deeply notched at the hilum, 4 to 6 mm. broad. (*Ill.* Pacif. R. Rep. iv, t. 9, f. 1–5; t. 22, f. 12–15)—Type, Bigelow of 1853 in Herb. Mo. Bot. Gard.

In rather fertile soil "at base of hills," from southern Colorado through western Texas, New Mexico, and Arizona.

Specimens examined: COLORADO (*Engelmann* of 1881): TEXAS (*Evans* of 1891, near El Paso): NEW MEXICO (*Bigelow* of 1853): ARIZONA (*Palmer* of 1869; *Evans* of 1891; *Trelease* of 1892).

This species is reported from the Llano Estacado, on the Upper Canadian, as a large and extensively spreading plant.

26. Opuntia tortispina Engelm. Syn. Cact. 293 (1856).

Prostrate, with ascending orbicular-obovate joints 15 to 20 cm. long: pulvini 2.5 to 3.5 cm. apart, with yellowish bristles: spines 3 to 5, white, angular, and channelled, often spirally twisted, 3.5 to 6 cm. long, with 2 to 4 more slender ones (1 to 2.5 cm. long) added below: flowers sulphur-yellow, 6 to 7.5 cm. broad: fruit ovate, with broad umbilicus, 4.5 to 5 cm. long: seeds orbicular, regular, and but slightly notched at hilum, 4 to 6 mm. broad. (*Ill.* Pacif. R. Rep. t. 8, f. 2, 3; t. 23, f. 1–5)—Type, Bigelow of 1853 in Herb. Mo. Bot. Gard.

From the plains of the Platte, Nebraska, to those of Indian Territory and northern Texas.

Specimens examined: NEBRASKA (*H. Engelmann* of 1858): INDIAN TERRITORY (*Bigelow* of 1853).

27. Opuntia mojavensis Engelm. Syn. Cact. 293 (1856).

Prostrate, with suborbicular joints: pulvini remote, with large yellow bristles: spines 2 to 6, stout and annulate, acutely angular and compressed, more or less curved, reddish-brown, paler toward tip, 2.5 to 6 cm. long, 1 to 3 smaller slenderer pale ones added below: fruit oblong, 4.5 cm. long. (*Ill.* Pacif. R. Rep. t. 9, f. 6–8)—Type, Bigelow of 1853 in Herb. Mo. Bot. Gard.

"On the Mohave, west of the Colorado," California.

Specimens examined: CALIFORNIA (*Bigelow* of 1853).

(3) *Ascending: joints rather small: spines few, terete or scarcely angular, slender, flexible, pale: fruit smaller than in* (2).

28. Opuntia tenuispina Engelm. Syn. Cact. 294 (1856).

Diffuse or ascending, about 3 dm. high, with obovate bright-green joints attenuate at base and 7.5 to 15 cm. long by 5 to 10 cm. broad: pul-

vini 1 to 2.5 cm. apart, with slender short bright reddish-brown bristles: spines 1 or 2, elongated (3.5 to 7.5 cm.), white (sometimes dusky at base and apex), teretish, straight, slender, flexile, suberect or spreading (in upper pulvini the upper one porrect and the rest deflexed), and 1 to 4 shorter (1 to 3 cm.) white inferior ones: flowers yellow, 6 to 7.5 cm. broad: fruit oblong, with deep umbilicus, 2.5 to 3 cm. long: seeds very irregular, with narrow margin and deeply notched hilum, 3 to 4 mm. broad (*Ill.* Cact. Mex. Bound. t. 75, f. 14)—Type, the Wright specimens in Herb. Mo. Bot. Gard.

Sandy ridges on the Rio Grande from El Paso, Texas, northward into adjacent New Mexico.

Specimens examined: NEW MEXICO (*Wright* of 1852, Doña Ana): TEXAS (*Wright* of 1851–52, El Paso): also cult. in Mo. Bot. Gard. 1870.

29. Opuntia setispina Engelm.; Salm, Hort. Dyck. 239 (1850).

Ascending, with small suborbicular glaucous joints not over 5 cm. long: pulvini crowded (6 to 8 mm. apart), with yellowish bristles: spines 4 to 10, very slender (like the bristles), 1 to 3 longer (2.5 to 3.5 cm.) and subangular, 3 to 7 shorter and more or less deflexed: flowers and fruit unknown.—Type, Wislizenus of 1846 in Herb. Mo. Bot. Gard.

"Pine woods in mountains west of Chihuahua."

Specimens examined: CHIHUAHUA (*Wislizenus* of 1846).

30. Opuntia filipendula Engelm. Syn. Cact. 294 (1856).

Ascending from a long thick tuberiferous root, 1.5 to 3 dm. high, with orbicular or obovate or oblanceolate thin bluish glaucous joints, 3.5 to 7.5 long by 2.5 to 5 cm. broad: pulvini 8 to 12 mm. apart, with white wool, greenish-yellow very slender numerous penicillate bristles (becoming very conspicuous), with or without spines: spines (if present) white, 1 or 2 elongated setaceous deflexed ones (not rarely subangular and twisted) 2.5 to 5 cm. long, and 1 or 2 smaller lower ones: flowers purplish, 6 cm. broad: seeds very thick, with narrow but thick and obtuse margins, 3.5 to 4 mm. broad. (*Ill.* Cact. Mex. Bound. t. 68)—Type, the Wright specimens in Herb. Mo. Bot. Gard.

Alluvial bottoms of the Rio Grande from the Pecos to El Paso, Texas, and southward into Chihuahua.

Specimens examined: TEXAS (*Wright* of 1852; *Schott* of 1855): CHIHUAHUA (*Pringle* 147; *E. A. Mearns* of 1892, "Mesquite Spring").

(4) *Procumbent or ascending: joints rather small: spines stout, subterete, white or dusky, or none: fruit clavate.*

31. Opuntia mesacantha Raf.; Seringe, Bull. Bot. Gen. 216 (1830).

Opuntia cespitosa Raf. l. c.

Opuntia rafinesquii Engelm. Syn. Cact. 295 (1856).

Opuntia vulgaris rafinesquii Gray, Man. ed. 2, 136 (1856).

Opuntia vulgaris in part of Amer. authors, not Haw.

Diffuse, from a fibrous root, with obovate or suborbicular very green joints 7.5 to 12.5 cm. long bearing elongated subulate spreading leaves 6 to 8 mm. long: pulvini 1.8 to 2.5 cm. apart, with slender reddish-

brown bristles, mostly unarmed: spines (when present) few, mostly only marginal, stout, terete, straight, erect or spreading, whitish (often reddish at base and apex), 1.8 to 2.5 cm. long, single, or 1 or 2 smaller deflexed ones in addition: flowers sulphur-yellow (often with red center), 6 to 8.5 cm. broad: fruit clavate, naked, with funnel-shaped umbilicus, 3.5 to 5 cm. long (less than half that in diameter), with acid or sweetish purplish pulp: seeds almost regular, compressed, with rather narrow and thick but acutish margins, 5 mm. broad (*Ill.* Pacif. R. Rep. iv, t. 10, f. 3–5; t. 23, f. 7, 8)—Type unknown.

Sterile, sandy or rocky soil in the Mississippi valley from Minnesota and Wisconsin to Kentucky, Missouri, Louisiana, and Texas; apparently not found west of the western boundary of Missouri and Arkansas.

Specimens examined: WISCONSIN (*Hale* of 1861, in part): ILLINOIS (*Engelmann* of 1833–34; *Hall* of 1861, sandy barrens of Mason Co.; *Hayden* of 1862; *Coulter* of 1894, growing): ARKANSAS (*Bigelow* of 1853): KANSAS (Hitchcock of 1893, sandhills near Manhattan): also cult. in Goebel's Gard. 1845; Mo. Bot. Gard. 1856; Harvard Bot. Gard. 1871; Meehan's Gard. 1885.

An exceedingly variable species, the principal varieties being described under the nine following forms.

32. Opuntia mesacantha grandiflora (Engelm.)

Opuntia intermedia Engelm. Pl. Lindh. 206 (1850), not Salm (1834).
Opuntia rafinesquii grandiflora Engelm. Syn. Cact. 295 (1856).

Somewhat ascending, with larger joints (12.5 to 15 cm. long), pulvini 2.5 cm. apart, very slender bristles, almost no spines, large flowers (11 to 12.5 cm. broad, red in center), and elongated fruit 6 cm. long. (*Ill.* Pacif. R. Rep. iv, t. 11, f. 2, 3)—Type, Lindheimer of 1847 in Herb. Mo. Bot. Gard.

On the Brazos, Texas.

Specimens examined: TEXAS (*Lindheimer* of 1847).

33. Opuntia mesacantha parva, nom. nov.

Opuntia rafinesquii minor Engelm. and Bigel. Pacif. R. Rep. iv, 41, name p. 55 (1856), not *O. minor* C. Muell.

Orbicular joints but 5 cm. in diameter, spineless or with a few on the upper margin. (*Ill.* Pacif. R. Rep. iv, t. 11, f. 1)—Type, Engelmann of 1845 in Herb. Mo. Bot. Gard.

Sandstone rock in southern Missouri.

Specimens examined: MISSOURI (*Engelmann* of 1845): also growing in Mo. Bot. Gard.

34. Opuntia mesacantha microsperma (Engelm.).

Opuntia rafinesquii microsperma Engelm. Syn. Cact. 295 (1856).

Almost unarmed, with more compressed smaller seeds (1.6 to 1.8 mm. broad) having narrower margins.—Type cult. in Mo. Bot. Gard. 1854 and preserved in Herb. Mo. Bot. Gard.

With the species.

Specimens examined: cult. in Mo. Bot. Gard. 1854, with no locality.

35. Opuntia mesacantha cymochila (Engelm.).

Opuntia rafinesquii cymochila Engelm. Syn. Cact. 295 (1856).

Opuntia rafinesquii cymochila montana Engelm. and Bigel. Pacif. R. Rep. iv, 42 (1856).

With orbicular mostly armed joints 6 to 8.5 cm. broad, pulvini 1.2 to 1.6 cm. apart, straw-colored or yellowish bristles, 1 to 3 stout white (often reddish-brown at base) subcompressed or twisted spreading or deflexed spines 2.5 to 5 cm. long (often 2 or 3 smaller deflexed ones added), short obovate fruit 2.5 to 3 cm. long, and irregular twisted undulate-margined seeds 5 mm. broad. (*Ill.* Pacif. R. Rep. t. 12, f. 1–3; t. 23, f. 10–12)—Type, the Bigelow specimens in Herb. Mo. Bot. Gard.

From Kansas to southwestern Texas, Arizona, and Utah.

Specimens examined: KANSAS (*Hall* of 1870): TEXAS (*Bigelow* of 1852; *V. Bailey* of 1892, Washburn): NEW MEXICO (*Bigelow* of 1853; *Evans* of 1891, Stein's Pass and Deming): ARIZONA (*Palmer* 302; *Wilcox* of 1894, Ft. Huachuca): UTAH (*Watson* 434).

36. Opuntia mesacantha stenochila (Engelm.).

Opuntia rafinesquii stenochila Engelm. Syn. Cact. 296 (1856).

Prostrate, with obovate joints 10 cm. long by 7.5 cm. broad, pulvini 2.5 cm. apart and only the upper ones armed, yellowish or greenish bristles, solitary white spine 2.5 to 3 cm. long with sometimes 1 or 2 smaller deflexed ones added, long obovate-clavate green or pale red very juicy fruit 3.5 to 6 cm. long and with a broad umbilicus, and regular thick very narrow and obtuse-margined seeds 5 mm. broad. (*Ill.* Pacif. R. Rep. iv, t. 12, f. 4–6; t. 23, f. 9)—Type, Bigelow of 1853 in Herb. Mo. Bot. Gard.

"Cañon of Zuñi, western New Mexico."

Specimens examined: NEW MEXICO (*Bigelow* of 1853).

37. Opuntia mesacantha macrorhiza (Engelm.).

Opuntia macrorhiza Engelm. Pl. Lindh. 206 (1850).

Opuntia rafinesquii macrorhiza Engelm. Syn. Cact. 296 (1856).

Opuntia rafinesquii fusiformis Engelm. l. c. 297.

Prostrate or ascending, with elongated fusiform irregularly thickened root, orbicular-obovate very green joints, most or only upper pulvini armed, yellowish-brown bristles, 1 to 3 stout or slender white or variegated spreading or deflexed spines 2.5 to 3 cm. long (often 1 or 2 additional slender deflexed ones), flowers 5 to 7.5 cm. broad, ovate (scarcely clavate) fruit green or pale-purple, 3.5 cm. long, and thick almost regular acute-margined seeds 5.5 mm. broad. (*Ill.* Cact. Mex. Bound. t. 69; Pacif. R. Rep. iv, t. 12, f. 7, 8; t. 23, f. 6)—Type, Lindheimer of 1843–45 in Herb. Mo. Bot. Gard.

From the "Big Bend" of the Missouri River to the Guadalupe River of Texas and Arizona; in sterile rocky places.

Specimens examined: TEXAS (*Lindheimer* of 1843–45, 1850, 1872; *Wright* of 1852; *Parry* of 1869; *Hall* of 1872): ARIZONA (*Bigelow* of 1853, on Deer Creek): KANSAS (*Wislizenus* of 1846, type of *fusiformis;*

Kellerman of 1888): ARKANSAS (no collector given, but cult. in Mo. Bot. Gard. from White River, near Fayetteville).

38. Opuntia mesacantha greenii, var. nov.

Opuntia greenii Engelm. MSS.

With fibrous roots, orbicular-obovate deep-green joints, numerous short reddish-brown bristles, upper pulvini armed with 1 to 3 spines (upper one straight, stout, terete, 2.5 to 3.5 cm. long, lower ones mostly smaller, paler and deflexed), which are brownish-red at base or entirely so, ovate spineless fruit 3 cm. long with rather shallow umbilicus, and irregular seeds with broad rather acute margins and 6 mm. broad.—Type, Greene of 1870 in Herb. Mo. Bot. Gard.

From Colorado to Arizona.

Specimens examined: COLORADO (*E. L. Greene* of 1870, Golden City; *C. S. Sheldon*, Ft. Collins): ARIZONA (*Toumey* of 1892, Grand Cañon and Williams; *Wilcox* of 1894, Ft. Huachuca).

39. Opuntia mesacantha oplocarpa, var. nov.

Opuntia oplocarpa Engelm. MSS.

Joints orbicular, deep-green, 7.5 to 8.5 cm. in diameter: pulvini with a penicillate tuft of long brown bristles at upper end, all armed except the lower ones: spines mostly 2, rather stout and straight, the upper one reddish-brown (especially toward the base), stouter, erect or porrect, the lower one paler (or even white), deflexed and usually weaker: fruit clavate, with broad and shallow umbilicus, rather dry, spineless (or nearly so), brownish-red, 5 cm. long: seeds wavy-twisted.—Type, Greene of 1870 in Herb. Mo. Bot. Gard.

Colorado to southwestern Texas.

Specimens examined: COLORADO (*E. L. Greene* of 1870. Golden City): TEXAS (*G. R. Vasey* of 1881, El Paso).

This certainly belongs to the maze of forms under *mesacantha*, and possibly may be referred to some of those described above. The seeds and orbicular joints suggest *cymochila*, but the prominent tufts of long brown bristles, the fewer spines, and the decidedly larger distinctly clavate unarmed fruit seem to justify separation for the present. The Vasey material has larger joints (about 12 cm. broad), and its spines are not always in pairs. Often there are three spines, two equally prominent brown upper ones and a lower and weaker deflexed white one, and even two or three very weak ones in addition appressed at lower edge of pulvinus. These characters are suggestive of *cymochila*, but the larger joints and prominent reddish-brown bristles are quite distinctive. The two varieties *greenii* and *oplocarpa* are very near each other, and aside from the seed characters are to be distinguished by the shape of the joints, by the fact that the former has its 1 to 3 spines only on the upper pulvini, and the latter, with its spines mostly in pairs, has all the pulvini armed except the lowest ones. In both, the upper reddish porrect or ascending spine or spines and the lower pale deflexed one are quite characteristic.

40. Opuntia mesacantha vaseyi, var. nov.

Approaches *oplocarpa*, but joints narrow and rather elongate-obovate (16 by 10 cm.), very large pulvini, the 2 or 3 spines (occasionally another short, slender one added) all reddish-brown (occasional trace of yellow-

ish) and unequal (15 to 30 mm.), those on the face of the joint usually in pairs and deflexed, those on the margin apt to be in threes and erect-spreading, fruit dark-red and spineless (about 5 cm. long), and seeds (4.5 to 5 mm. broad) with conspicuous thick somewhat irregular margin.—Type in Nat. Herb.

Western Arizona.

Specimens examined: ARIZONA (*G. R. Vasey* of 1881, Yuma; *H. H. Rusby* of 1883, Ft. Verde).

41. Opuntia fusco-atra Engelm. Syn. Cact. 297 (1856).

Diffuse, with orbicular-obovate tuberculate joints 6 to 7.5 cm. long: pulvini 12 to 18 mm. apart, with numerous short reddish-brown bristles, only the lower unarmed: spines mostly solitary, stout, suberect, brownish-black, 2.5 to 3 cm. long, often one shorter deflexed one added: flowers yellow, 7.5 cm. broad: fruit and seed unknown. (*Ill.* Pacif. R. Rep. iv, t. 11, f. 4)—Type, Lindheimer 33 of 1842 in Herb. Mo. Bot. Gard.

"Sterile places in prairies west of Houston, Texas."

Specimens examined: TEXAS (*Lindheimer* 33 of 1842).

The stout brown (or above almost black) spines, and thick bunches of unusually stout brown bristles on small joints, give a characteristic appearance to the species.

42. Opuntia opuntia (L.).

Cactus opuntia L. Sp. Pl. i, 468 (1753).
Opuntia vulgaris Mill. Dict. ed. 8, no. 1 (1768).
Cactus humifusus Raf. Ann. Nat. i, 15 (1820).

Diffuse and prostrate, with a fibrous root: joints obovate or suborbicular, thick, bright or pale green, 5 to 10 cm. long by 5 to 6 cm. broad, bearing ovate cuspidate mostly appressed leaves 4 to 5 mm. long: pulvini subremote, with few short greenish-yellow bristles, mostly unarmed: spines very rare, when present, solitary, stout, variegated, suberect, less than 2.5 cm. long: flowers pale-yellow, 5 cm. broad: fruit obovate-clavate: seeds regular, thick, with thick margins, 5 mm. broad.—Type unknown.

From the southeast coast of Massachusetts to Georgia and Florida; apparently only in the low countries east and southeast of the Alleghanies.

Specimens examined: MASSACHUSETTS (*Sprague*, at Leyden): NEW YORK (*Hex. & Maier* of 1852): NEW JERSEY (*Torrey & Gray* of 1846; *Hex. & Maier* of 1854; *Meehan* of 1876; *Martindale* of 1876): DELAWARE (*Canby* of 1861): VIRGINIA (*Vasey* of 1878, Ft. Monroe): SOUTH CAROLINA (*Mellichamp* of 1871): also cultivated in numerous gardens.

This species is distinguished from *mesacantha* (which only grows west of the Alleghanies and with which it has been confused) by its smaller size, paler color, small pulvini, usual absence of spines, smaller flowers, and especially by its short thick more or less appressed leaves.

43. Opuntia pes-corvi Le Conte; Chapm. Fl, 145 (1860).

Prostrate and diffuse, bright-green, with small ovate or obovate swollen and often teretish fragile joints 2.5 to 7.5 cm. long and half as thick: pulvini 8 to 16 mm. apart, with few very short slender and pale bristles, the lowest unarmed: spines 1 to 3, straight and slender, rigid, often compressed at base and twisted, dusky, 2.5 to 3.5 cm. long: flowers yellow, 3.5 to 4 cm. broad: fruit obovate, bristly, rose-purple, with shallow umbilicus, fleshy, 12 to 14 mm. long: seeds very few (1 or 2), narrowly and obtusely margined, 4 mm. broad.—Type unknown.

Barren sands, coast of Georgia and Florida.

Specimens examined: FLORIDA (*Chapman* of 1856 and 1860; *Hitchcock* of 1890): also cult. in Harv. Bot. Gard., 1871; Mo. Bot. Gard., 1882.

Evidently very near *O. opuntia*, and possibly only a small thick-jointed variety.

++ ++ *Joints pubescent: erect or procumbent.*

(1) *Flowers yellow: spineless plants.*

44. Opuntia microdasys Lehm. Ind. Sem. Hamb. 16 (1827).

Opuntia pulvinata DC. Rev. Cact. 119 (1828).

Erect-spreading, 6 to 12 dm. high: joints oblong-obovate or orbicular, pubescent, bright-green, 5 to 7.5 cm. long by 3.5 to 5 cm. wide: leaves minute: pulvini 12 to 16 mm. apart, with yellow wool and numerous very slender yellow bristles, spineless: flowers yellow: fruit unknown.—Type unknown.

From Coahuila to southern Mexico.

Specimens examined: COAHUILA (*Gregg* 284 of 1847; *Palmer* of 1880; *Pringle* 3592): also growing in Mo. Bot. Gard., 1893.

45. Opuntia rufida Engelm. Syn. Cact. 298 (1856).

Erect-spreading, 6 to 12 dm. high, much branched: joints broadly obovate or suborbicular, pubescent, pale-green, 5 to 15 cm. long: leaves long acuminate, 5 mm. long: pulvini crowded, with penicillate tufts of very numerous slender reddish-brown bristles, spineless: flowers yellow, 6 cm. broad.—Type, Bigelow and Gregg specimens in Herb. Mo. Bot. Gard.

On the Rio Grande (on rocks and mountains) about Presidio del Norte, Chihuahua, southward to the valley of the Nazas, Durango.

Specimens examined: CHIHUAHUA (*Bigelow* of 1852, about Presidio del Norte): DURANGO (*Gregg* 634, valley of the Nazas).

Differs from *O. microdasys* in its more rounded and larger joints, longer leaves, and reddish-brown bristles.

(2) *Flowers red.*

46. Opuntia basilaris Engelm. Syn. Cact. 298 (1856).

Low, with obovate or triangular glaucescent minutely pubescent ascending joints 12.5 to 20 cm. long and proliferous (almost rosulate) from the base: leaves minute, 2 mm. long: pulvini 8 to 12 mm. apart,

depressed, with yellow wool, very slender and short at length very numerous reddish-brown bristles, and caducous bristly spines (but no spines proper): flowers rich-purple (reported as sometimes white), 6 cm. broad: fruit short-obovate, with broad umbilicus, dry, pubescent: seeds large, thick, subregular, with rather narrow but very thick margin, 6 to 10 mm. broad. (*Ill.* Pacif. R. Rep. t. 13, f. 1–5; t. 23, f. 14)—Type, the Bigelow, Schott, and Campbell specimens in Herb. Mo. Bot. Gard.

From southern Utah and Nevada (Silver Peak region) southward through western Arizona and southeastern California into Sonora.

Specimens examined: UTAH (*Gabb* of 1867): ARIZONA (*Bigelow* of 1854; *Schott* of 1855, on the Lower Gila; *Campbell* of 1855; *Newberry* of 1858; *Palmer* of 1869; *Rusby* of 1883; *Toumey* of 1892, Yuma): CALIFORNIA (*Schott* 2 of 1855; *Hayden* of 1858; *A. E. Janvier* of 1873, Ehrenberg; *Palmer* of 1876; *Weber* of 1877; *Engelmann* of 1880; *G. R. Vasey*, Whitewater; *Nevin* of 1882; *Trelesse* of 1892).

Dr. Merriam says that this species is one of the commonest cactuses of the Sonoran deserts. Its apperance is quite characteristic, a large number of joints of different shapes (obovate, fan-shaped, obcordate, emarginate, elongated or almost oblanceolate) issuing from the base at nearly the same point, forming a sort of rosette "resembling somewhat an open cabbage head."

47. Opuntia basilaris ramosa Parish, Bull. Torr. Club, xix, 92 (1892).

"Spreading, the joints freely branching above; joints and fruit glabrous"—Type, in Herb. Parish.

Dry washes and gravelly benches of the Colorado and Mojave deserts.

Specimens examined: CALIFORNIA (*Parish Bros.* of 1882, Whitewater).

Mr. Parish has called attention to the fact that this is the common form of the species in southern California, and says that only near the summit of the Cajon Pass has he seen plants branching at the base. If this be true, doubtless many of the specimens referred above to *basilaris* are *ramosa*, but there seems to be no way of separating them by the characters of single isolated joints. It is probably also true that this very abundant cactus will be found throughout its range to show both habits of branching, which must give rise to plants of very different appearance. The specimen cited above as having been examined shows but a single joint, but the joint and fruit are glabrous. I doubt whether the pubescent character will hold, as I have a glabrous joint with pubescent fruit.

48. Opuntia treleasii, sp. nov.

Erect, diffusely branching: joints orbicular to obovate, fleshy, with terete base, 15 to 25 cm. long: pulvini not depressed, with long (5 cm.) dense dirty-yellow bristles: leaves on young shoots 5 mm. long, spreading (more than twice as long as those of *basilaris* and darker-red): flower and fruit not seen.—Type, growing in Mo. Bot. Gard. 1893, from collection made by Trelease in 1892.

At Caliente, in the Tehachapi Mountains, California.

Specimens examined: CALIFORNIA (*Trelease* of 1892).

This species is near *O. basilaris*, but differs in its rounder more fleshy joints (terete below), pulvini not depressed (in *O. basilaris* there is a depression for the pulvinus with a furrow on either side in the general surface), yellowish bristles, and especially in its much larger leaves.

+ + *Fruit dry and spiny: seed with very broad margin: diffuse and very spiny.*

++ *Joints compressed, suborbicular.*

49. Opuntia hystricina Engelm. Syn. Cact. 299 (1856).

Diffuse, with obovate-orbicular compressed joints 7.5 to 12.5 cm. long: pulvini 10 to 12 mm. apart, with closely set yellowish or brownish bristles, all armed: spines 10 to 15; the upper 5 to 8 (rarely 1 to 8) stoutish but flexile, angular, twisted or flexuous, erect, spreading or deflexed, whitish or brownish, 3.5 to 10 cm. long; the lower 5 to 7 more slender, radiant downward, white, 8 to 18 mm. long: flowers yellow or purple, 5 to 7.5 cm. broad: fruit obovate, with very shallow flattish umbilicus, 2.5 cm. long: seeds irregular, black, with broad and thick acutish margins, 7 mm. broad. (*Ill.* Pacif. R. Rep. t. 15. f. 5–7; t. 23, f. 15)—Type, Bigelow of 1853 in Herb. Mo. Bot. Gard.

Extending from the western side of the Rio Grande, in New Mexico, to southeastern California and Nevada.

Specimens examined: NEVADA (*H. Engelmann* of 1859; *Watson* 436, Regan's Valley): ARIZONA (*Bigelow* 124 of 1853; *Newberry* of 1858; *Palmer* of 1870, and 474 of 1890, Ft. Huachuca; *Toumey* of 1892, Grand Canyon): CALIFORNIA (*Palmer* 4 of 1876; *Parish Bros.* 168 of 1882; *Parish* of 1891; *Trelease* of 1892).

This species may fairly stand as the southwestern representative of *O. polyacantha*, from which it differs in its longer and more numerous gray or reddish spines, longer yellow bristles, and usually smaller flowers.

50. Opuntia polyacantha Haw. Suppl. Pl. Succ. 82 (1819).

Cactus ferox Nutt. Gen. i, 296 (1818), not Willd.

Opuntia media Haw. l. c.

Opuntia missouriensis DC. Prodr. iii, 472 (1828).

Opuntia missouriensis elongata Salm, Cact. Hort. Dyck. 67 (1850).

Opuntia missouriensis rufispina Engelm. Syn. Cact. 300 (1856).

Prostrate, forming large spreading masses: joints light-green, orbicular, tuberculate, 5 to 10 cm. (rarely 10 to 15 cm.) long: leaves minute, 3 to 4 mm. long: pulvini 8 to 12 mm. apart, with reddish-brown bristles (fewer but longer and darker than in other forms), all armed: spines 8 to 15; the 5 to 10 (generally 6 to 8) exterior ones radiant, setiform, whitish or reddish variegated; the 3 to 5 interior ones stout, reddish-brown (paler-tipped), 3 to 5 cm. long, 2 to 4 of them deflexed, the other one spreading or suberect and very stout: flowers yellow (orange within) or sometimes purple: stigmas 5 to 8: fruit ovate, dry and spiny, with shallow flat umbilicus, 2.5 cm. long: seeds irregular, large (5 to 6 mm. broad). (*Ill.* Pacif. R. Rep. t. 14, f. 1–3)—Type unknown.

Principally on the plains, but also in the mountains to the south, from the Upper Missouri and Washington to the Canadian River (Ind.

Terr.), the Upper Pecos (New Mex.), and Utah (throughout the Salt Lake Basin and the foothills of the Wahsatch).

Specimens examined: MONTANA (*Canby* 140 of 1883): COLORADO (*Farwell* 1062): NEW MEXICO (*Bigelow* of 1853, on the Upper Pecos, type of *rufispina*).

The extreme polymorphism of this species has resulted in a maze of bewildering forms impossible to classify. The form known as *rufispina* (*Cactus ferox* Nutt.) is the typical one, as described above and as illustrated by the specimens cited above. In addition to the five rather distinct varieties described below there is a large number of what may be called miscellaneous forms, not exactly typical, but not departing from the type sufficiently to be set apart as varieties. These miscellaneous forms, so far as examined, are as follows:

WASHINGTON (*Lyall* of 1860; *Suksdorf* 314): OREGON (*Cusick* 1389; *Spalding*, at Clearwater): MONTANA (*Hayden* 1854 and 1859): SOUTH DAKOTA (*Hayden* 1853 and 1855): NEBRASKA (*Hayden* of 1855; *Rydberg* of 1891, Phelps and Deuel Cos.): NEVADA (*Watson* of 1869; *Coville & Funston* 1981): UTAH (*Palmer* 4): COLORADO (*Hall & Harbour* 68, 183; *Hall* of 1862; *Greene* 36 of 1873; *Jones* 504): INDIAN TERRITORY (*Hall* of 1869, Canadian River): NEW MEXICO (*Bigelow* of 1853; *Rothrock* 6 of 1874, Santa Fe): also cult. in Hort. Salm-Dyck. 1847; in Harv. Bot. Gard. 1871; growing in Mo. Bot. Gard. 1893.

51. Opuntia polyacantha platycarpa (Engelm.).

Opuntia missouriensis platycarpa Engelm. Syn. Cact. 300 (1856).

Joints elongated-obovate to obovate-orbicular, 7.5 to 12.5 cm. long: pulvini 12 to 18 mm. apart, with few straw-colored bristles, the lower ones sometimes unarmed, or upper with few spines (sometimes only 6 to 12 mm. long), or with exterior spines, as in the species, and mostly one stout spreading or deflexed reddish-brown interior one: fruit depressed-globose, with a remarkably large and flat umbilicus, 16 to 18 mm. long. (*Ill.* Pacif. R. Rep. iv, t. 14, f. 4)—Type, the Hayden specimens of 1853–54 from Nebraska and Montana in Herb. Mo. Bot. Gard.

In the Upper Missouri region, from Idaho and Montana to Utah, Colorado, and Nebraska.

Specimens examined: IDAHO (*MacDougal* 280): MONTANA (*Hayden* of 1854): UTAH (*Watson* 434 of 1869, Parley's Park; *Hayden* of 1871; *Ward* 187, 443): COLORADO (*Parry* of 1869): NEBRASKA (*Hayden* of 1853–54).

52. Opuntia polyacantha borealis, nom. nov.

Opuntia missouriensis microsperma Engelm. & Bigel. Pacif. R. Rep. iv, 46 (1856), not *mesacantha microsperma* Engelm.

Joints and spines as in *platycarpa:* fruit ovate, with depressed umbilicus, shortly spiny: seeds smaller, 4 mm. broad, with narrow and acute margin. (*Ill.* Pacif. R. Rep. iv, t. 14, f. 5–7; t. 24, f. 1, 2)—Type, the "Fur traders" specimens of 1847 in Herb. Mo. Bot. Gard.

From British Columbia to Oregon and South Dakota.

Specimens examined: BRITISH COLUMBIA (*Macoun* 5): OREGON (*Drake & Dickson* of 1889): SOUTH DAKOTA ("Fur traders" of 1847; *Hayden*): also cult. in St. Louis Gard. 1847.

53. Opuntia polyacantha albispina (Engelm. and Bigel.).

Opuntia missouriensis albispina Engelm. and Bigel. Pacif. R. Rep. iv, 46 (1856).

Joints broadly obovate: bristles straw-colored: spines 6 to 12, all ivory-white and more slender, 2.5 to 3 cm. long, the outer 6 to 10 setaceous, the inner (in upper pulvini) 1 to 3 stouter, elongated, deflexed or spreading: flowers 7.5 to 8.5 cm. broad: fruit ovate, with very shallow umbilicus: seeds irregular, with broad and acutish margin, 6 to 7 mm. broad. (*Ill.* Pacif. R. Rep. iv, t. 14, f. 8–10; t. 23, f. 18)—Type, Bigelow of 1853 in Herb. Mo. Bot. Gard.

"Sandy mountains, near Albuquerque," New Mexico, is the original station; reported also from western Utah, and now found in Indian Territory.

Specimens examined: NEW MEXICO (*Bigelow* of 1853): INDIAN TERRITORY (*M. A. Carleton* of 1891).

The Carleton specimens seem certainly to represent this lost variety, which will doubtless be recognized over a wide area, but which may not stand as a worthy variety.

54. Opuntia polyacantha watsoni, var. nov.

Joints smaller, creeping, orbicular, 5 cm. broad: pulvini much crowded (6 to 8 mm. apart), bearing darker bristles: spines all dark; outer 3 or four from the lower edge of the pulvinus (sometimes 1 or 2 added above) setaceous, 4 to 5 mm. long; inner 1 to 3 stouter, much longer (10 to 36 mm), deflexed (except on margin of joint): stigmas 10: fruit clavate, 2.5 to 3 cm. long, strongly tuberculate and cristate, deeply umbilicate, with few spines: seeds with broad margin and prominently notched at hilum.—Type, specimens cited below in Herb. Mo. Bot. Gard.

From Nebraska and Wyoming to Colorado, Utah, and New Mexico.

Specimens examined: NEBRASKA (*Hayden* of 1853): WYOMING (no collector recorded, at Alden): COLORADO (*French* of 1874): UTAH (*Watson* 435 of 1869, Wahsatch Mts.): NEW MEXICO (*Fendler* of 1846–47, near Santa Fe).

55. Opuntia polyacantha trichophora (Engelm.).

Opuntia missouriensis trichophora Engelm. Syn. Cact. 300 (1856).

Joints ovate: pulvini crowded, with straw-colored at length whitish, bristles, all armed: spines 10 to 18, white, setiform and capillary flexuous (in old joints very numerous, 15 to 25); the outer 8 to 12 shorter and radiant, the inner longer and deflexed, rarely a single suberect one: fruit ovate, 20 mm. long by 14 mm. broad: seeds very large (7 mm.), strongly compressed, broadly and acutely margined. (*Ill.* Pacif. R. Rep. iv, t. 15, f. 1–4; t. 23, f. 19)—Type, Bigelow of 1853 in Herb. Mo. Bot. Gard.

New Mexico (about Santa Fe and Albuquerque) and Texas (in the El Paso region); on volcanic rocks.

Specimens examined: NEW MEXICO (*Bigelow* of 1853; *G. R. Vasey* of 1881, Socorro): TEXAS (*Trelease* of 1892): also growing in Mo. Bot. Gard. 1893.

The hoary appearance of older joints is very characteristic, "like an old man's beard." Vasey's excellent specimens help to a better understanding of this variety, which may deserve to rank as a species. The white outer radiant spines are 6 to 12 mm. long; the inner ones whitish or reddish-yellow, becoming grayish and much elongated and capillary, becoming as much as 6 or 7 cm. long and appearing in dense tufts on old joints, looking like a covering of coarse hair.

56. Opuntia sphærocarpa Engelm. Syn. Cact. 300 (1856).

Diffuse, with orbicular strongly tuberculate joints 7.5 cm. broad: pulvini 8 to 10 mm. apart, with short, straw-colored bristles, mostly unarmed (only the uppermost and marginal ones bearing spines): spines 1 or 2, reddish-brown, deflexed or spreading, 12 to 25 mm. long, often 1 to 3 shorter (4 to 8 mm.) ones added: fruit perfectly globose, with a small flat shallow umbilicus, scarcely spinulose, 18 mm. in diameter: seeds very irregular, with narrow but acute margin, 5 mm. long. (*Ill.* Pacif. R. Rep. iv, t. 13, f. 6, 7; t. 24, f. 3)—Type, Bigelow of 1853 in Herb. Mo. Bot. Gard.

"Mountains near Albuquerque," New Mexico.

Specimens examined: NEW MEXICO (*Bigelow* of 1853).

57. Opuntia sphærocarpa utahensis Engelm. Trans. St. Louis Acad. ii, 199 (1863).

Prostrate and diffuse, with orbicular-obovate thick joints 5 to 7.5 cm. broad (younger often globose-obovate), pulvini 12 to 16 mm. apart, spines none or on upper pulvinus smallish or rarely one straight stout white one, yellow flowers 7.5 cm. broad, obovate fruit 2.5 cm. long (half as wide), with deep umbilicus, and seeds 4 to 5 mm. long.—Type, H. Engelmann of 1859 in Herb. Mo. Bot. Gard.

"Utah Basin (pass west of Steptoe Valley)" is the original locality, and that of Hayden is not recorded.

Specimens examined: UTAH (*H. Engelmann* of 1859; *Hayden* of 1876): also cult. in Mo. Bot. Gard. 1876.

++ ++ *Joints tumid, ovate.*

58. Opuntia rutila Nutt.; Torr. & Gr. Fl. i, 555 (1840).
Opuntia erinacea Engelm. Syn. Cact. 301 (1856).

Ascending and diffuse: joints swollen, ovate or teretish, 5 to 10 cm. long by 2.5 to 7.5 cm. broad (sometimes elongated and almost cylindrical): pulvini very crowded (4 to 6 mm. apart), with white wool, and at length straw-colored bristles, all armed: spines 3 to 5, slender, reddish-gray, 1 to 4 cm. long (1 to 3 upper shorter and erect, central one longer, spreading or declined, the rest deflexed, sometimes larger ones flattened and often twisted), 2 to 4 smaller ones added below: flowers rose-red or paler: fruit ovate, dry and spinulose, with a deep funnelform umbilicus, 2.5 to 3 cm. long: seeds large (6 mm. broad), much compressed, with broad acute margins. (*Ill.* Pacif. R. Rep. iv, t. 13, f. 8–11; t. 24, f. 4)—Type of *O. rutila* unknown, of *O. erinacea*, Bigelow of 1854 in Herb. Mo. Bot. Gard.

From Green River, southwestern Wyoming (the original Nuttallian

station), through Utah and Nevada into Arizona and southeastern California.

Specimens examined: UTAH (*Watson* of 1868; *Palmer* of 1870 and 1877, Fillmore to St. George; *Johnson* of 1870; *Ward* 188; *Bailey* 1939): NEVADA (*Shockley* 274; *Bailey* 1959, 1989; *Coville & Funston* 1941): ARIZONA (*Palmer* of 1870): CALIFORNIA (*Bigelow* of 1854, near the Mojave; *Coville & Funston* 2013, 2014).

The numerous reddish-gray spines with red points bristling hedgehog-like in every direction give a very characteristic appearance. Dr. Merriam says of it: "Species with enormously long and slender spines, not found in California except on the Panamint Mountains."

59. Opuntia arenaria Engelm. Syn. Cact. 301 (1856).

Ascending and diffuse, 1.5 to 3 dm. high, spreading 6 to 9 dm.: roots stout, creeping horizontally, elongated and often stoloniferous, far spreading in the loose sand: joints obovate, thick and swollen or subcompressed, or teretish, shining-green, strongly tuberculate, 3.5 to 7.5 cm. long by 2.5 to 5 cm. broad: leaves minute: pulvini 6 to 10 mm. apart, with sparse white wool, and numerous bristles (especially on old joints), which are pale when young and tawny when old, almost all armed: spines 3 to 10; the upper 1 to 4 stouter, whitish or reddish-brown, often subangular, 2 to 3.5 cm. long (the uppermost one stouter and porrect, the rest shorter and divergent or deflexed); the lower 2 to 6 shorter (4 to 12 mm.), setaceous and radiant, white: flowers sulphur-yellow, 5 to 6 cm. broad: fruit oblong-ovate, contracted at top, dry and spinose, with a deep funnelform umbilicus, 2 to 3 cm. long: seeds irregular, with broad thick margin, 5 to 6 mm. long. (*Ill.* Cact. Mex. Bound. t. 75, f. 15)—Type, the Wright specimens in Herb. Mo. Bot. Gard.

Sandy bottoms of the Rio Grande near El Paso, Texas, and adjacent New Mexico.

Specimens examined: TEXAS (*Wright* of 1851, 1852, and 1854; *Schott*): NEW MEXICO (*Fendler* 7, 150, 153): also cult. in Mo. Bot. Gard. 1855.

Allied to *fragilis*, but distinguished by the larger more tuberculate joints, smaller pulvini with more numerous bristles, longer slenderer spines, and spinose fruit

60. Opuntia fragilis (Nutt.) Haw. Suppl. Pl. Succ. 82 (1819).
Cactus fragilis Nutt. Gen. i, 296 (1818).

Subdecumbent, with small ovate subcompressed or subglobose (even terete) scarcely tuberculate shining green joints variable in size and shape (fruit-bearing ones compressed, 3.5 to 5 cm. long by 2.5 to 3 cm. broad, the others smaller and more tumid): pulvini large, 8 to 12 mm. apart, with white wool, and very few short whitish bristles (on old joints a little more abundant, coarser, and straw-colored): spines 1 to 4 (mostly 4 and cruciate), the uppermost one stout, angular, suberect or porrect, yellowish-brown, 12 to 20 mm. long, the others weaker (6 to 16 mm.), paler, spreading or radiant, and 2 to 6 additional slender white radiant ones below 4 to 8 mm. long: flowers pale-yellow, about 5 cm. broad: fruit ovate, almost naked, with funnelform umbilicus,

about 2.5 cm. long: seeds few, large (6 mm.), with broad and thick obtuse corky margin. (*Ill.* Pacif. R. Rep. iv, t. 24, f. 5)—Type unknown.

From British Columbia southward through Minnesota and Montana to Wisconsin, Kansas, Colorado, and Utah; fertile prairies or sterile places.

Specimens examined: BRITISH COLUMBIA (*Dawson* of 1885): MINNESOTA (*Dawson* of 1884): WISCONSIN (*Hale* of 1861, in part, Baraboo bluffs): MONTANA (*Canby* of 1883): NEBRASKA (*Hayden* of 1854): KANSAS (*Fisher* of 1893, Ellsworth): COLORADO (*Parry* of 1864): UTAH (*Engelmann* of 1858; *Watson* 437, Utah Valley): also cult. in Mo. Bot. Gard. 1855; growing in same garden in 1893.

Dr. Engelmann says that this species is very common on sterile prairies at the base of the Rocky Mountains, but that it is rarely found in flower and still more rarely in fruit. It propagates chiefly by the extremely brittle joints which even the wind breaks off and carries about.

61. Opuntia fragilis brachyarthra (Engelm.).

Opuntia brachyarthra Engelm. Syn. Cact. 302 (1856).

Prostrate or ascending, with swollen tuberculate joints, pulvini 4 to 8 mm. apart, 3 to 5 stouter whitish or brownish terete spines 18 to 25 mm. long (1 or 2 spreading or suberect, the rest deflexed), flowers about 2.5 cm. broad, and somewhat spinulose fruit. (*Ill.* Pacif. R. Rep. iv, t. 12, f. 9)—Type, Bigelow of 1853 in Herb. Mo. Bot. Gard.

Southern Colorado and northern New Mexico.

Specimens examined: COLORADO (*Greene* of 1871): NEW MEXICO (*Bigelow* of 1853, near Santa Fe).

The other New Mexican station is "under pine trees, Inscription Rock, near Zuñi." It is a question whether this form should stand as a distinct variety, but its more constantly swollen tuberculate joints, more crowded pulvini, more numerous and stouter and terete spines, smaller flowers, and more spinulose fruit may serve to indicate it. "The short and tumid joints resemble the joints of a finger."

Among Dr. Weber's manuscript notes the four following *Platopuntia* forms are characterized, but the information concerning them is so meager that I do not venture to publish his names.

OPUNTIA sp. "Cultivated from Venado southward to San Luis Potosi under the name 'tuna chaveña.' A tall plant, bearing a sweet, pleasant-tasted fruit which is much brought to market. Flowers red. Fruit the size of an egg, wine-red; pulp reddish. Seed large, much compressed."

OPUNTIA sp. "Cultivated about San Luis Potosi under the name 'tuna blanca.' Plant high (3 m.?), quite spiny. Fruit very large, ovoid, with whitish pulp. Cultivated for the fruit, which is much esteemed, but not so frequently as 'cardona.' Could it be a form of *ficus-indica?* But the seed is much larger than that of the Italian forms of that species."

OPUNTIA sp. "A tall, large-jointed species, with slender acicular spines. Fruit ovoid, spineless, with a larger rather flat umbilicus with circular wrinkles, and apparently numerous (perhaps 35 or 40) circular

areolæ. Seed remarkably small. Erect, 9 to 12 dm. high." This may be *O. strigil.*

OPUNTIA sp. "A very tall (27 to 36 dm.), large-jointed, erect plant, with numerous spines (lower ones and especially central ones deflexed), and ovoid fruit which is red inside and out. Known as 'cardona,' and most commonly cultivated in and about San Luis Potosi. Abundantly eaten fresh and mashed and dried in a paste or cheese-like form; also the purple juice expressed and drunk with water like orangeade."

II. CYLINDROPUNTIA. *Joints cylindraceous, more or less tuberculate: seeds not margined* (except in ** -+- +-).

* *Low plants with short clavate joints and without a firm woody skeleton: larger spines angular-compressed and without sheaths* (*exc.* clavellina *and* tunicata): *flowers yellow* (*exc.* pulchella), *large: fruit dry and very bristly.*

-+- *Spines short* (3 to 20 mm).

62. Opuntia bulbispina Engelm. Syn. Cact. 304 (1856).

Prostrate, in spreading masses 6 to 12 dm. in diameter, with fusiform roots: joints small (18 to 24 mm. long and 12 mm. in diameter), ovate (scarcely clavate), fragile, often proliferous from apex, with ovate tubercles 6 to 12 mm. long: pulvini scarcely bristly: spines teretish, scabrous, bulbous at base; interior 4 cruciate, 8 to 12 mm. long (the lower the longer); exterior 8 to 12 radiant, 3 to 6 mm. long: flower and fruit unknown. (*Ill.* Cact. Mex. Bound. t. 73, f. 5, 6)—Type, Gregg of 1848 in Herb. Mo. Bot. Gard.

From New Mexico to Coahuila.

Specimens examined: NEW MEXICO (*Nealley* of 1891): COAHUILA (*Gregg* of 1848, near Perros Bravos, Saltillo).

In Watson's Bibliographical Index and in the Kew Index this is made a synonym of *tunicata*, but it differs in almost every respect, having no sheaths, much shorter spines, and small and much shorter joints.

63. Opuntia parryi Engelm. Amer. Journ. Sci. ser. 2, xiv, 339 (1852).

Prostrate, with ovate joints (clavate at base) 6 to 10 cm. long and bearing oblong elongated tubercles 18 mm. long: pulvini with few rigid brownish bristles: spines very numerous, in three series, angular, scabrous, reddish-gray (at length ashy); interior about 4, stouter, triangular-compressed, 24 to 32 mm. long; the next exterior 4 to 8, divergent, angular, 6 to 16 mm. long; the most exterior (but mostly lateral or inferior) 6 to 10 slender, rigid, radiant: fruit ovate, clavate at base, very spiny, 3.5 cm. long: seeds regular, beakless, with broader commissure than usual, 4 to 5 mm. in diameter. (*Ill.* Pacif. R. Rep. iv, t. 22, f. 4–7)—Type not found in the Engelmann collection.

Gravelly plains of the Mojave, southeastern California.

Specimens examined: CALIFORNIA (*Bigelow* of 1853).

Distinguished from *O. clavata* by the shape of the joints, the bristles, the slenderer darker more numerous spines, and the smaller more regular beakless seeds. Dr. Parry's original specimen was collected near San Felipe.

64. Opuntia clavata Engelm. Wisliz. Rep. 11 (1848).

Low cespitose plant, forming dense spreading level-topped masses 6 to 12 dm. in diameter and with ascending branches: joints shortly clavate, bright-green, 2.5 to 7.5 cm. long and 2.5 cm. thick, with ovate tubercles 12 to 16 mm. long, and subulate leaves 4 to 5 mm. long: pulvini large and closely approximate, with white rigid bristles: spines white and scabrous; interior 4 to 7, flattened, 12 to 30 mm. long, the upper one triangular and erect, the lower ones broader (broadest 3 mm.), striate above and keeled below, deflexed; exterior 6 to 12, more slender, 4 to 16 mm. long, radiating in every direction: flowers yellow, 5 cm. broad: fruit elongate-clavate, deeply umbilicate, lemon-yellow, 3.5 to 4 cm. long and 2.5 cm. in diameter, almost covered with white slender radiating bristles: seeds beaked, 5 to 6 mm. in diameter, with impressed linear commissure. (*Ill.* Pacif. R. Rep. iv, t. 22, f. 1–3; t. 24, f. 6: Cact. Mex. Bound. t. 73, f. 5, 6)—Type, Wislizenus and Fendler specimens of 1846 and 1847 in Herb. Mo. Bot. Gard.

In the region about Albuquerque and Santa Fe, New Mexico; also in southern Nevada, and presumably to be found in adjacent Utah and Arizona.

Specimens examined: NEW MEXICO (*Wislizenus* of 1846, near Albuquerque; *Fendler* 275 of 1846 and 1847, near Santa Fe; *Bigelow* of 1853; *Rothrock* 92, El Rito; *Vasey* 173): NEVADA (*Coville & Funston* 430).

65. Opuntia pulchella Engelm. Trans. St. Louis Acad. ii, 201 (1863).

Small, cespitose, 7.5 to 25 cm. high, the main stem erect: joints obovate-clavate, lightly tuberculate, 2.5 to 7.5 cm. long: pulvini crowded: upper spines from white to nearly black, straight, 8 to 36 mm. long, a single one longer, flattened, porrect or deflexed); the others radiant and very short (1 to 3 mm.): flowers bright purplish-red or deep rose-red, 3 to 3.5 cm. broad: fruit clavate, about 2.5 cm. long, with numerous flexible not barbed bristles: seeds thick and round, 4 mm. in diameter, with broad, flat commissure.—Type, H. Engelmann of 1859 in Herb. Mo. Bot. Gard.

Western and southern Nevada and adjacent Arizona; presumably in southeastern California.

Specimens examined: NEVADA (*H. Engelmann* of 1859, Walker River; *Gabb* of 1867, Walker River; *Watson* 438, Monitor Valley; *Lieut. Wheeler* of 1872; *Lemmon* 943; *Shockley* 319): ARIZONA (*Bischoff* of 1871).

Remarkable in this group for its purple flowers.

++ *Spines long* (2.5 to 6 cm.).

66. Opuntia grahami Engelm. Syn. Cact. 304 (1856).

Prostrate, with thick fusiform roots: joints short-clavate, bright-green, ascending, 3.5 to 5 cm. long, with oblong tubercles 12 to 14 mm. long: leaves ovate, 4 mm. long: pulvini with white wool, and bristles at length very numerous, elongated and rigid: spines slender, scabrous, reddish, at length ashy brown; interior ones 4 to 7, teretish or quad-

rangular or rarely compressed, stouter, spreading, 3.5 to 5 cm. long; exterior ones 4 to 6 and much smaller: flowers yellow, 5 cm. broad: fruit ovate, very spiny: seed beakless, 5 to 5.5 mm. in diameter, with indistinct linear commissure. (*Ill.* Cact. Mex. Bound. t. 72)—Type, Wright specimens of 1851 in Herb. Mo. Bot. Gard.

Sandy bottoms of the Rio Grande near El Paso, Texas, and downward.

Specimens examined: TEXAS (*Wright* 10, 40, 539, of 1851; *Evans* of 1891; *E. A. Mearns* of 1892, El Paso).

67. Opuntia emoryi Engelm. Syn. Cact. 303 (1856).

Prostrate and spreading, 15 to 45 cm. high: joints cylindrical with clavate base, glaucous, ascending and curved, 10 to 15 cm. long and 2.5 to 3.5 cm. in diameter, with oblong-linear elongated (2.5 to 3.5 cm.) closely approximated tubercles: pulvini with few rigid bristles: spines very numerous, pitted or roughened, reddish-black or brown, at length ashy; interior ones 5 to 9, stouter, triangular, compressed, porrect or deflexed (upper ones only suberect), 3.5 to 6 cm. long, 1.5 to 2 mm. broad; exterior ones 10 to 20, in many series, radiating in every direction, the exterior gradually smaller and less angular, the upper slenderer and teretish, the lower more rigid and compressed: flowers yellow, reddish without, 5 to 6 cm. broad: fruit ovate, clavate at base, yellow, very bristly and spiny, 5 to 6 cm. long: seeds irregular, 4.5 to 6.5 mm. in diameter, with mostly an indistinct transverse commissure. (*Ill.* Cact. Mex. Bound. t. 70–71)—Type, specimens of Wright and Bigelow in Herb. Mo. Bot. Gard.

Arid soil, from the El Paso region of Texas westward into Arizona and southward into Chihuahua and Sonora.

Specimens examined: TEXAS (*Evans* of 1991): NEW MEXICO (*Wright & Bigelow*, at Copper Mines; *G. R. Vasey* of 1881, Socorro): ARIZONA (*Schott* 8 of 1758): CHIHUAHUA (*Bigelow* 43 of 1852).

68. Opuntia schottii Engelm. Syn. Cact. 304 (1856).

Prostrate, with short-clavate ascending joints 5 cm. long and bearing elongated tubercles 16 to 18 mm. long: pulvini with few bristles: spines very scabrous, reddish (broader ones with white margin); interior about 4, cruciate, 3.5 to 5 cm. long; upper triangular and erect, the rest plane above and convex beneath, the lower broader; exterior 8 to 10, slender and radiant, very unequal, 8 to 18 mm. long: fruit obovate-clavate, somewhat spiny: seeds beaked, angular, 4 mm. in diameter, with linear, indistinct commissure. (*Ill.* Cact. Mex. Bound. t. 73, f. 1–4)—Type, specimens of Schott and Wright in Herb. Mo. Bot. Gard.

On arid hills, between the San Pedro and Pecos, Texas.

Specimens examined: TEXAS (*Wright* of 1849; *Schott* 853; *Weber* of 1866).

Distinguished by its broad and very rough dirty-red spines and scanty bristles.

69. Opuntia schottii greggii Engelm. Cact. Mex. Bound. t. 73, f. 4 (1859).

Tubercles longer (20 to 24 mm.): spines stout, somewhat less rough and more slender, 12 to 15, some borne on upper margin of pulvinus; the 4 centrals triangular, much less rough, 2.5 to 4 cm. long; the 8 to 12 exterior ones of very different sizes. (*Ill.* l. c.)—Type, Gregg of 1848 in Herb. Mo. Bot. Gard.

San Luis Potosi.

Specimens examined: SAN LUIS POTOSI (*Gregg* of 1848).

This form is described by Engelmann in Synopsis Cactaceæ (1856) and in Cactaceæ of the Mexican Boundary, but with no name, the name being first given in explanation of plates in the latter work.

70. Opuntia invicta Brandegee, Pl. Baja Calif. 163 (1889).

Low and branching, about 3 dm. high: joints 10 cm. long and 4 to 7.5 cm. thick: radial spines 6 to 10, slender and radiant, 6 to 10 mm. long (sometimes longer); central spines 10 to 15, very stout and rigid, quadrangular or flattened, strongly striate, ashy at base with lighter tips, spreading in every direction, 2.5 to 4.5 cm. long: flowers yellow, abundant, 5 cm. broad: fruit covered with reddish spines: seeds 2 mm. in diameter.—Type in Herb. Brandegee.

Common about San Juanico and north to El Campo Aleman, Lower California.

Specimens examined: LOWER CALIFORNIA (*Brandegee*).

It is difficult in this species to distinguish exactly the line between centrals and radials, as they somewhat intergrade. The species is an uncertain one, and may be a *Cereus*, but it groups well enough with *O. schottii* to be retained at present in *Opuntia*.

71. Opuntia clavellina Engelm. MSS.

Stems frutescent, about 9 dm. high: joints slender, clavate, 5 to 10 cm. long and a little over 1 cm. in diameter, with elongated tubercles: spines 3 to 6, stout, 1 to 3.5 cm. long, with straw-colored or brown sheaths, the central one longer and porrect: flowers yellow: fruit clavate, short, tuberculate.—Type, Gabb 22 and 23 in Herb. Mo. Bot. Gard.

On volcanic tables, western slope of the peninsula, near Mission Purissima, Lower California.

Specimens examined: LOWER CALIFORNIA (*Gabb* 22, 23).

72. Opuntia tunicata (Lehm.) Pfeiff. Enum. 170 (1837).
Cactus tunicatus Lehm. Ind. Sem. Hort. Hamb. 17 (1827).

Suberect, very branching, 3 dm. high and 2.5 to 3.5 cm. in diameter: joints dusky-green, clavate, almost terete, 16 to 20 mm. in diameter, with short leaves and depressed tubercles: pulvini with white wool: spines 6 to 9 (almost wanting in some localities) from lowest part of pulvinus, 4 to 6 upper ones larger, 2.5 to 5 cm. long, 2 or 3 lowest short (8 to 12 mm.), all white and with a subpellucid sheath.—Type unknown.

Throughout Mexico and the West Indies and southward through South America to Brazil.

Specimens examined: COAHUILA (*Gregg* of 1848–49): SAN LUIS POTOSI (*Gregg* of 1848; *Parry* of 1878; *Parry* and *Palmer* 282; *Borracte* of 1880; *Eschanzier* of 1891): MEXICO, with no state given (*Bourgeau* 304 of 1865): CUBA (*Wright* of 1860–64): also growing in Mo. Bot. Gard. 1893.

This very widely distributed species is also reported in Mexico from Sonora and Raza Island (in northern part of the Gulf of California).

** *Stems more or less erect, much branched: joints mostly cylindrical: woody skeleton solid or tubular and reticulated: larger spines terete and sheathed: flowers purplish (mostly yellow in +++).*

+ Wood mostly reticulate-tubular: joints thick, with distinct tubercles: spines numerous.

++ Diffusely branched: joints subclavate: flowers mostly yellow: fruit dry and spiny.

73. Opuntia ciribe Engelm. MSS.

Short, robust, and arborescent, densely branched, rarely more than 9 dm. high, but very compact: joints obovate, 5 cm. long and 3 cm. in diameter, with crowded angular obovate tubercles 6 mm. long: pulvini sparsely if at all bristly: large spines 3 to 5, pale-yellow, sheathed, 12 to 16 mm. long; 4 to 6 small dark bristly unsheathed ones on lower part of pulvinus: flowers yellow: fruit tuberculate like the joint. Type, Gabb 24 in Herb. Mo. Bot. Gard.

Lower California, "from Comondu and Loreto northward beyond Rosario."

Specimens examined: LOWER CALIFORNIA (*Gabb* 24).

74. Opuntia davisii Engelm. Syn. Cact. 305 (1856).

Stem spreading and somewhat procumbent, with dense wood and divaricate branches, 4.5 dm. high: joints attenuate at base, rather slender, 10 to 15 cm. long (younger ones erect), with oblong-linear tubercles 14 to 16 mm. long: inner spines 4 to 7, subtriangular, divergent, reddish-brown, in a loose straw-colored sheath, 2.5 to 3.5 cm. long; lower ones 5 or 6, slender, 6 to 12 mm. long: flower yellowish?: fruit ovate, spiny, 2.5 cm. long or more. (*Ill* Pacif. R. Rep. iv, t. 16.)—Type, Bigelow of 1853 in Herb. Mo. Bot. Gard.

From northwestern Texas through New Mexico and southern Colorado to southern California.

Specimens examined: TEXAS (*Bigelow* of 1853, "Staked Plains;" *Mensebach* of 1879 and 1882): NEW MEXICO (*Rusby* 145): COLORADO (*Brandegee* of 1875): ARIZONA (*Palmer* 303 of 1870, Bear Springs): CALIFORNIA (*Parish* of 1880): also cult. Mo. Bot. Gard. 1877 and 1882; and growing 1893.

75. Opuntia echinocarpa Engelm. Syn. Cact. 305 (1856).

A low shrub 1.5 to 4.5 dm. high, with reticulate-woody stem, erectish or partially prostrate, with numerous very spreading branches: joints ovate, clavate at base, 2.5 to 6 cm. long, less than 2.5 cm. thick, with prominent ovate crowded tubercles 8 to 10 mm. long: pulvini with few

coarse straw-colored bristles: larger spines about 4, cruciate, whitish, in a straw-colored or whitish sheath 18 to 24 mm. long; smaller ones 8 to 16, hardly sheathed, radiating in every direction, 8 to 18 mm. long: flowers greenish-yellow, 3.5 to 4 cm. broad: fruit dry, depressed-globose or hemispherical, broadly and deeply umbilicate, very spiny: seeds subregular or angular, thick, 4 mm. in diameter or more, with broad commissure. (*Ill.* Pacif. R. Rep. iv, t. 18, f. 5–10; t. 24, f. 8.)—Type, specimens of Bigelow and Schott in Herb. Mo. Bot. Gard.

From southern Utah and southern Nevada through northern and western Arizona and southeastern California into Sonora.

Specimens examined: UTAH (*Palmer* 187; *Johnson*, at St. George; *Bailey* 1960 of 1891): ARIZONA (*Bigelow* of 1854, near mouth of Williams River; *Schott* 7, at Ft. Yuma; *Parry* of 1881; *Toumey* of 1892, Banning and Yuma): CALIFORNIA (*Hitchcock* of 1875; *Engelmann* of 1880; *Parry* of 1881; *G. R. Vasey* of 1881, Whitewater).

This is said to be the common arborescent *Cylindropuntia* of the Mojave desert region and the deserts of southern Nevada. The hemispherical fruit, with broad and deep umbilicus, is often described as "saucer-shaped." The spines are sometimes very short.

76. Opuntia echinocarpa robustior, nom. nov.

Opuntia echinocarpa major Engelm. Syn. Cact. 305 (1856), not *phaeacantha major* Engelm.

Taller (12 to 15 dm. high), with elongated (20 to 25 cm.) joints attenuate at base, oblong linear tubercles 12 to 18 mm. long, slender penicillate bristles, longer and fewer spines (the 4 central ones 2.5 to 4 cm. long, only 4 to 8 smaller radiant ones), looser sheath and fruit globose or clavate at base.—Type not found in the Engelmann collection.

Along the Lower Colorado in Arizona and California, and southward into Sonora.

Specimens examined: ARIZONA (*G. R. Vasey* of 1881, Yuma): CALIFORNIA (*Newberry* of 1858; *Lemmon* of 1878; with no collector given in 1880; *Parish Bros.* of 1882).

77. Opuntia echinocarpa parkeri (Engelm.).

Opuntia parkeri Engelm. MSS.

Taller (9 to 15 dm. high), with erect branches, longer (10 cm.) joints, crested tubercles 18 mm. long, light yellowish-brown spines in sheaths of similar color (about 6 smaller radiant ones), depressed globose or oval less spiny fruit with flat or funnelform umbilicus, and irregular seeds (6 mm. in diameter) with narrow twisted commissure.—Type, C. F. Parker of 1879 in Herb. Mo. Bot. Gard.

San Diego County, California, east side of mountains facing desert.

Specimens examined: CALIFORNIA (*C. F. Parker* of 1879).

78. Opuntia echinocarpa nuda, var. nov.

Spines slender, short and numerous, reddish-brown, often with lighter tips, the larger ones (1 to 1.5 cm. long) with brownish-yellow sheaths: flowers greenish-yellow, about 3 cm. high and 2 cm. broad: fruit obo-

vate, about 2 cm. long, with broad shallow umbilicus, almost if not entirely spineless (occasionally a few spines persisting for a time): seeds almost regular, but slightly compressed, 3.5 to 5 mm. broad, with a straight but hardly broad commissure.—Type in Herb. Brandegee.

Lower California, near San Gregorio.

Specimens examined: LOWER CALIFORNIA (*Brandegee* of 1889).

79. Opuntia serpentina Engelm. Amer. Jour. Sci. ser. 2, xiv, 338 (1852).

? Cereus (?) californicus Torr. & Gr. Fl. i, 555 (1840), not *Opuntia californica* Engelm. Emory's Rep. 157 (1848).

Somewhat erect (7.5 to 12.5 dm. high) or prostrate, diffuse, with elongated, subverticillate, divaricate ascending branches: joints elongated-cylindrical, 15 to 30 cm. long, 2 to 3 cm. in diameter, with prominent ovate tubercles: pulvini with whitish bristles: spines 7 to 15, light-yellowish or rusty, sheathed, 6 to 18 mm. long, upper ones stellate-divaricate, lowest ones deflexed: flowers greenish-yellow, reddish outside, cup-shaped, 3.5 cm. broad: fruit subhemispherical, with broad and deep umbilicus ("saucer-shaped"), dry, long-woolly and very spiny, yellowish-brown, about 18 mm. long: seeds thick, irregular, with narrow commissure.—Type not found in the Engelmann collection.

On dry hillsides near the seacoast about San Diego, California.

Specimens examined: CALIFORNIA (*Schott* of 1854; *Hitchcock* of 1875; *Engelmann* of 1880; *G. R. Vasey* of 1880, San Diego): LOWER CALIFORNIA (*Brandegee*, Magdalena Bay): also cult. Mo. Bot. Gard. 1876.

The Lower Californian specimens have 20 or more spines, all stellately spreading with no special lower one deflexed. The fruit is 3 to 4 cm. long, and the seeds 2 to 3 mm. broad, light brown.

80. Opuntia bernardina Engelm. Bull. Torr. Club, xix, 92 (1892).

A loosely branched shrub several stemmed from the base, erect with ascending or erectish branches, rather slender, 6 to 15 dm. high, with reticulate wood: joints cylindrical, 7.5 to 30 cm. long, with slender elongated oblong tubercles 2.5 to 3 cm. long (very prominent on younger joints, shorter and less marked on older ones): pulvini with a dense row of very short dark more or less persistent bristles at upper edge, and spreading often recurved leaves 4 to 8 mm. long: spines yellow; the sheathed ones 4 or 5, 1 to 3 cm. long, the lowest longest and mostly deflexed; and 4 appressed short (6 to 12 mm.) slender radial ones mostly on lower edge of pulvinus: flowers greenish-yellow tinged with brownish-red outside, 2.5 to 4 cm. broad: fruit ovate, deeply umbilicate, tuberculate (each tubercle with a single short spine), less than 2.5 cm. long, at length dry: seed flat, 6 mm. broad, with a channelled commissure and conspicuous persistent funiculus.—Type, Parry of 1851, G. Engelmann of 1880 and 1882, and Parish 814 in Herb. Mo. Bot. Gard.

Dry hills and mesas in the San Bernardino plain, California, northward through Cajon Pass, and in Santa Clara Valley.

Specimens examined: CALIFORNIA (*Parry* of 1851; *Parker* of 1874;

G. Engelmann of 1880 and 1882; *G. R. Vasey* of 1881; *Parish* 814; *Trelease* of 1892).

The common *Cylindropuntia* of the San Bernardino Valley. Apparently it does not extend to the coast region or the desert.

81. Opuntia tesajo Engelm. MSS.

With very short woody stem, and growing in little clumps 3 dm. or less in diameter: joints slender and not distinctly tuberculate: flowers simple, bell-shaped, yellow.—Type, Gabb 26 in Herb. Mo. Bot. Gard.

"Among rocks, especially toward the west coast and in the more central portions," Lower California.

Specimens examined: LOWER CALIFORNIA (*Gabb* 26 of 1867).

Certainly a very meager description, but as full as the material justifies and possibly sufficient for subsequent identification.

++ ++ *Arborescent: joints tumid and fragile: tubercles depressed; flowers purple: fruit mostly sterile and proliferous.*

82. Opuntia prolifera Engelm. Amer. Journ. Sci. ser. 2, xiv, 338 (1852).

Stem 9 to 30 dm. high, 5 to 17.5 cm. in diameter, with reticulated woody cylinder, and numerous horizontal very divaricate branches: joints ovate or ovate-cylindrical, tumid, fragile, congested toward apex of branches, very green, lower at length refracted and brown, 7.5 to 15 cm. long and 3.5 to 5 cm. in diameter, with obovate-oblong tubercles 12 mm. long: pulvini tomentose, and the older with fine straw-colored bristles: spines 8 to 10, very variable, always with large loose sheaths which are light yellowish or rusty, 2.5 to 3.5 cm. long, one being subcentral and the rest stellate-spreading, the lower shorter (12 to 16 mm.): flowers dark-red, salverform, 3.5 cm. broad: fruit clavate, obovate or subglobose, deeply umbilicate, strongly tuberculate like the joints, nearly always abortive and usually proliferous: seeds large, regular, 6 mm. broad, with broad prominent commissure.—Type not found in the Engelmann collection.

Dry hills in southern California and adjacent Arizona, and extending into Lower California (San Ignacio and northward) and the adjacent islands (Guadalupe, Santa Catalina, San Clemente).

Specimens examined: CALIFORNIA (*Gabb* 21 of 1867; no collector given of 1874; *Parker of* 1876; *Engelmann* of 1880; *G. R. Vasey* of 1880, San Diego): ARIZONA (*Trelease* of 1892, at Benson): also cult. in Meehan's Gard. 1879.

Mr. Schott's notes describe this species as "on arid hills about San Diego, near dry beds of streams, forming impassable and extensive thickets which are like unapproachable coral reefs." Mr. Brandegee notes that in Lower California it is "sometimes almost spineless."

83. Opuntia fulgida Engelm. Syn. Cact. 306 (1856).
Opuntia fulgens Engelm. Bot. Calif. i, 250 (1876).

Stem erect, flexuose, 15 to 36 dm. high, 15 cm. in diameter, with reticulate wood and few divaricate branches: joints ovate or ovate-

cylindrical, tumid, glaucous, congested at apex of branches, 7.5 to 20 cm. long, often 5 cm. in diameter, with ovate-oblong hardly prominent tubercles 12 to 14 mm. long: pulvinus woolly, with pale straw-colored bristles: spines 5 to 9, about equal, with loose lustrous sheaths, porrect-stellate (completely hiding the surface of young joints), 2.5 to 3 cm. long: flowers small, purple, cup-shaped, less than 2.5 cm. broad: fruit ovate, with flat umbilicus, fleshy, spineless but with large white tomentose pulvini, 2.5 to 3 cm. long, becoming dull-purple, oftenest sterile and fasciculately proliferous: seeds much compressed and very angular, beaked, with narrow commissure, 2 to 3 mm. broad (or with beak often 4 mm.). (*Ill.* Cact. Mex. Bound. t. 75, f. 18)—Type not found in the Engelmann collection.

From southern Nevada through Arizona and the mountains of western Sonora and Lower California.

Specimens examined: NEVADA (*Coville & Funston* of 1891, Cottonwood Springs): ARIZONA (*Palmer* 100 and 104 of 1867; *Bischoff* of 1872; *Parry* of 1881, Tucson; *Rusby* of 1883, Peach Springs; *Evans* of 1891, Tucson; *Toumey* of 1892, Tucson): SONORA (*Schott* 8; also a Pringle photograph): LOWER CALIFORNIA (*Brandegee* of 1889, Calamuget and Magdalena Island): also growing in Mo. Bot. Gard., 1893.

Very conspicuous on account of its shining spines, and hence called "vela de coyote," or "candle of the wolf." With a more arborescent form than *bigelovii*. The upper joints do not detach readily and hence propagation by joints must be rare. According to Parry, also, the proliferous fruits do not seem to develop plants. Brandegee notes in his Lower California specimens that the flowers are sometimes "light-yellow with reddish tinge," and sometimes the spines are hardly equal.

84. Opuntia fulgida mamillata (Schott).

Opuntia mamillata Schott; Engelm. Syn. Cact 308 (1856).

More tree-like, with a distinct trunk and dense top, 15 to 18 dm. high: joints 7.5 to 10 cm. long, 3.5 cm. in diameter, with prominent ovate tumid tubercles ("like those of *Mamillaria*"): pulvini with very short bristles, or none: spines 4 to 6, slender, short (6 to 18 mm.), mostly deflexed, with straw-colored sheaths: seeds scarcely beaked, smaller and with narrower commissure.—Type, Schott 6 in Herb. Mo. Bot. Gard.

Southern Arizona and Sonora.

Specimens examined: ARIZONA (*Palmer* 105 of 1867; *Engelmann* of 1880): SONORA (*Schott* 6).

Dr. Engelmann's manuscript notes indicate that he had come to the conclusion that *mamillata* could not be regarded as specifically distinct from *fulgida*.

85. Opuntia bigelovii Engelm. Syn. Cact. 307 (1856).

Erect and arborescent, 30 to 36 dm. high, 7.5 to 10 cm. in diameter, with reticulated wood, numerous erect or ascending branches congested and forming a dense head, the lower at length refracted and brown: joints ovate or ovate-cylindrical, tumid, bright or pale green, fragile, 5 to 15 cm. long and 2.5 to 5 cm. in diameter, with depressed-hemispherical crowded tubercles 6 to 8 mm. long: pulvini immersed, with a

penicillate tuft of pale bristles: stouter spines 6 to 10, pale straw-colored and in lustrous whitish sheaths, 1 to 2.5 cm. long, usually 2 or 3 deflexed and the rest divergent; slenderer ones 6 to 10, lower and radiating, 8 to 14 mm. long: flowers purple, 2.5 to 4 cm. broad: fruit ovate, deeply umbilicate, tuberculate, unarmed or with a few spines, fleshy and greenish, 2.5 to 5 cm. long: seeds small and very irregular. (*Ill.* Pacif. R. Rep. iv, t. 19, f. 1–7)—Type, Bigelow of 1854 in Herb. Mo. Bot. Gard.

From southern Nevada southward through western Arizona and southeastern California, into Lower California.

Specimens examined: NEVADA (*Bailey* of 1891): ARIZONA (*Bigelow* of 1854, Williams River; *Schott* of 1855; *Parry* of 1880, on the Colorado): CALIFORNIA (*Parry* of 1876; *Engelmann* of 1879; *Parish* of 1880 and 1882, San Bernardino; *G. R. Vasey* of 1881, Whitewater; *Trelease* of 1892): LOWER CALIFORNIA (*Brandegee* of 1889, Purissima and Comondu).

Distinguished from *fulgida* and *prolifera* by its short tubercles, immersed pulvini, and large tuberculate somewhat spiny fruit. The young joints are very fragile. The tuft of bristles is borne at the notched tips of the imbricate tubercles. The spines are variable as to number and direction, ranging from the numbers and directions given in the above description to a single sharply deflexed spine. The seeds seem sometimes quite regular and discoid, 3 to 4 mm. broad.

++ ++ ++ *Frutescent or arborescent: joints cylindrical: tubercles mostly prominent and crested: flowers purple.*

(1) *Fruit not spiny.*

86. Opuntia whipplei Engelm. Syn. Cact. 307 (1856).

Stem erect, rarely spreading or subprostrate, 2 to 18 dm. high, with reticulate wood and divaricate branches: joints cylindrical, 5 to 30 cm. long, 1 to 2 cm. in diameter, with ovate crowded tubercles 10 mm. long: pulvini sparsely woolly and scarcely bristly: spines short, with ashy or straw-colored sheaths, 1 to 4 larger ones divaricate (the lower longer and deflexed), 6 to 18 mm. long, 2 to 8 smaller ones at lower margin, deflexed or radiating in every direction: flowers red: fruit subglobose, with funnelform umbilicus, lightly tuberculate, unarmed, yellow, somewhat fleshy and sweet, about 2.5 cm. long: seeds regular, 3 to 3.5 mm. broad, with linear commissure. (*Ill.* Pacif. R. Rep. iv, t. 24, f. 9, 10)—Type, specimens of Bigelow and Wright in Herb. Mo. Bot. Gard.

From southern Utah and Nevada through New Mexico and Arizona to southern California, Sonora, and Lower California.

Specimens examined: UTAH (*Palmer* of 1877, St. George; *Parry* of 1881, *Bailey* of 1879–81, Santa Clara Creek): NEW MEXICO (*Wright* of 1849; *Bigelow* of 1853; *Carleton* 385 of 1891): ARIZONA (*Bigelow* of 1853–54; *Palmer* of 1867 and 1870; *Bischoff* of 1871; *Engelmann* of 1880; *Lemmon* of 1881; *Pringle* of 1881, San Xavier Mission; *Parry* of 1881; *Rusby* 623 of 1883, Prescott; *Newberry* of 1888; *Evans* of 1891; *Toumey* of 1892, Tucson; *Wilcox* of 1894, Ft. Huachuca): CALIFORNIA (*Agassiz*, San Diego): LOWER CALIFORNIA (*Palmer* 161 of 1890, Raza Island).

87. Opuntia whipplei spinosior Engelm. Syn. Cact. 307 (1856).

Taller (small trees 18 to 30 dm. high), with rhombic tubercles, mostly longer (12 to 18 mm.), much more numerous (commonly 12 to 14) stellate-porrect and mostly radiant spines, cup-shaped flowers 3 to 3.5 cm. broad, and larger seeds (4 mm.). (*Ill.* Pacif. R. Rep. iv, t. 17, f. 1–4)—Type, Schott 5 of 1855 in Herb. Mo. Bot. Gard.

Southern Arizona.

Specimens examined: ARIZONA (*Schott* 5 of 1855; *Pringle* of 1881; *Vasey* of 1881; *Toumey* of 1892, Phœnix and Tucson; *Wilcox* of 1894, Ft. Huachuca).

In giving the range Schott notes "from Gila River south to Santa Cruz River and Tucson and further east." The flowers are sometimes more or less yellow-tinged.

88. Opuntia arborescens Engelm. Wisliz. Rep. 6 (1848).

Cactus cylindricus James, Cat. 182 (1825); not *Cereus cylindricus* Haw. Syn. 183 (1812).

Cactus bleo Torr. Ann. N. Y. Lyc. ii, 202 (1828), not HBK.

Opuntia exuviato-stellata Lem.; Lab. Monogr. Cact. 492 (1845); but this is only *Opuntia stellata* Salm, ined.

Arborescent and erect, northward 15 dm. high, southward becoming 60 to 90 dm. high, 12.5 to 25 cm. in diameter, with verticillate, horizontally divaricate or pendulous very spiny branches: joints verticillate (mostly in 3s or 4s), cylindrical and very green, 5 to 15 cm. long, less than 2.5 cm. in diameter, with prominent elongated compressed-cristate tubercles 14 to 18 mm. long, and terete elongated spreading leaves 12 to 20 mm. long: pulvini with short wool, but scarcely bristly: spines 8 to 30, terete, horny or reddish-brown, in straw-colored sheaths, porrect in every direction, 1 to 8 interior ones longer (16 to 28 mm.), more loosely sheathed, the central subdeflexed, the exterior ones weaker, closely sheathed, 8 to 16 mm. long, all sometimes very short: flower purple, 6 to 7.5 cm. broad: fruit globose or hemispherical, 2.5 cm. in diameter, variously umbilicate (dependent on prominence of upper tubercles), prominently cristate-tuberculate, unarmed, dry or nearly so, yellow; seeds regular, smooth, 3 to 4 mm. broad, with narrow commissure. (*Ill.* Pacif. R. Rep. iv, t. 17, f. 5, 6; t. 18, f. 4; t. 24, f. 12; Cact. Mex. Bound. t. 75, f. 16, 17)—Type, Wislizenus of 1846 and Fendler of 1847 in Herb. Mo. Bot. Gard.

From central Colorado southward through Texas, New Mexico, and Arizona into Chihuahua and Sonora and far southward.

Specimens examined: COLORADO (*Parry*, Canyon City; *Pringle* of 1881, Trinidad; *Alice Eastwood* of 1890, Durango; *Mrs. S. B. Walker* of 1894, Canyon City): TEXAS (*Wright* of 1851–52; *G. R. Vasey* of 1881, El Paso; *Evans* of 1891): NEW MEXICO (*Wislizenus* 307 of 1846; *Fendler* 277 of 1847, Santa Fe; *Wright* 354, 390, 399; *Bigelow* of 1853–54; *Bolander* of 1872; *G. R. Vasey* of 1881, Socorro; *Mrs. Sumner* 1002; *Carleton* of 1891; *Evans* of 1891, Lordsburg; *Mearns* of 1892, Carrizallilo Mts.): ARIZONA (*Emory* of 1848; *Coues & Palmer* of 1865; *Bis-*

choff of 1871; *Lemmon* 305; *Palmer* 800; *Rothrock* 101, 584; *Pringle* of 1881; *Vasey* of 1881; *Palmer* of 1890, Ft. Huachuca; *Nealley* of 1891, Silver City; *Wilcox* of 1894, Ft. Huachuca; *Dr. Loew*, Chloride): SONORA (*Thurber* 336): COAHUILA (*Palmer* 377 of 1880): also cult. in Mo. Bot. Gard. 1862, growing in 1893.

A Mexican species of wide range and extending northward to the plains of Colorado, covering extensive tracts. Nealley's specimens, from Silver City, Arizona, have shorter perpendicular and suberect central spines, shorter than the radials. Vasey's from El Paso have tubercles 25 to 30 mm. long, which so separate the bunches of spines that the joints have not their usual spiny appearance. Palmer 377 from Coahuila was distributed as *imbricata*, and I doubt not that much Mexican *arborescens* has been mistaken for that species. The 1 or 2 white spines of *imbricata*, as well as its clavate joints, should easily distinguish it from *arborescens*, although it is very doubtful whether it deserves specific separation.

89. Opuntia imbricata (Haw.) DC. Prodr. iii, 471 (1828).
Cereus imbricatus Haw. Rev. 70 (1812).

An irregular branching shrub 9 to 15 dm. high, with trunk often 7.5 cm. in diameter, branching above, solitary or forming thickets: joints more or less clavate, with prominent compressed-cristate tubercles, and elongated subulate leaves: pulvini with straw-colored wool: spines 1 or 2, white, setaceous or rigid, sheathed: flowers rose-colored, crowded near the summit of late branches: fruit depressed-globose, umbilicate: seed thick, irregular, 3 to 3.5 mm. in diameter. (*Ill.* Cact. Mex. Bound. t. 73, f. 7, 8)—Type unknown.

From Coahuila and San Luis Potosi to southern Mexico.

Specimens examined: COAHUILA (*Palmer* 370 of 1880; *Parry & Palmer* 281): STATE OF MEXICO (*Gregg* 568, 677, 684, 685 of 1849): ZACUALCO (*Bourgeau* 264 of 1865–66): MEXICO, with no state indicated (*Wright* of 1847): also cult. Gard. Montpel. 1126.

Very closely related to *arborescens*, and possibly only a small sparsely armed form of it, but in the absence of type material or even complete material it is for the present kept separate.

90. Opuntia versicolor Engelm. MSS.

Arborescent, with spineless trunk 5 to 7.5 cm. in diameter, irregularly much branched: joints cylindrical, 12 to 18 cm. long or more, about 1.5 cm. in diameter, with linear rather prominent tubercles (when young) 1 to 2.5 cm. long, soon flattening and disappearing on older branches, and round-ovate cuspidate leaves: pulvini with short gray wool, and usually a small cluster of bristles at upper edge: spines 4 to 13 on young joints, 15 to 20 on older ones, stellate, reddish-brown, with straw-colored sheaths (close and soon disappearing), the inner 1 to 4 usually deflexed and unequal (6 to 13 mm.), the radials shorter: flowers yellow, 2 to 2.5 cm. broad: fruit becoming clavate, 2 to 2.5 cm. long, at length reddish or yellowish and apparently dry: seeds irregular, angular, about 5 mm. broad, with narrow commissure.—Type, specimens of Parry, Pringle, G. Engelmann, and Miller, in Herb. Mo. Bot. Gard.

Neighborhood of Tucson and Benson, Arizona, on mesas and foothills.

Specimens examined: ARIZONA (*Parry* of 1880 and 1881; *G. Engelmann* of 1880; *Pringle* of 1881; *Miller* of 1881: *Nealley* of 1891; *Toumey* of 1892, Tucson).

This species has been distributed under this name ever since 1881, but I have been unable to find any published description. Toumey's specimens have much shorter, more prominent, and more crowded tubercles than usual.

91. Opuntia molesta Brandegee, Pl. Baja Calif. 164 (1889).

Stems few, sparingly branched, 12 to 18 dm. high: cylindrical joints 15 to 20 cm. long and 2.5 cm. in diameter, with few not prominent tubercles: spines 5 to 9, of which 1 to 3 are 2.5 to 5 cm. long, the rest less than 1.2 cm. long, all reddish-brown to blackish, the 2 upper large ones divaricate, the lower one porrect or deflexed, the small and apparently naked ones usually at lower edge of pulvinus and deflexed: flower purple, 5 cm. broad: fruit obovate, juicy, 2.5 to 4 cm. long, not tuberculate or spiny, but with remnants of the woolly pulvini: seeds very irregular, with a swollen, warty look, the narrow commissure in a deep furrow, 5 to 8 mm. in diameter.—Type in Herb. Brandegee.

San Ignacio, Lower California.

Specimens examined: LOWER CALIFORNIA (*Brandegee* of 1889).

Mr. Brandegee says that the long spines are sometimes not present. Their sheaths are straw-color to brownish, very loose and bladdery, giving the spines a massive look when unbroken.

92. Opuntia calmalliana, sp. nov.

Habit and height unknown: joints cylindrical, 1 to 2 cm. in diameter, glaucous, with linear-oblong crested (mostly distinct) tubercles 20 to 25 mm. long: pulvini densely covered with yellowish wool, and with a penicillate tuft of whitish bristles at upper edge: spines usually 4, the upper one stout and porrect, reddish with yellowish tip (as are all the spines), 2 to 2.5 cm. long (occasionally 1 or 2 short upper ones added), the usually 3 (sometimes 4) lower ones more slender and sharply deflexed, 1 to 1.5 cm. long (occasionally one of them longer): flowers apparently purple: ovary covered with very prominent woolly pulvini which are more or less bristly and spiny, but ripening into a smooth juicy obovate fruit: seeds discoid and beaked, irregularly angular, with broad commissure, about 4 mm. broad.—Type in Herb. Brandegee.

Calmalli, Lower California.

Specimens examined: LOWER CALIFORNIA (*Brandegee* of 1889).

This species is closely related to *molesta*, but its spines are different, though on the same general plan, and its seeds are very different.

(2) *Fruit more or less spiny.*

93. Opuntia thurberi Engelm. Syn. Cact. 308 (1856).

Erect and frutescent: joints slender-cylindrical (12 mm. in diameter), with oblong-linear tubercles 18 mm. long: pulvini with short yellow wool and scarcely any bristles: spines 3 to 5, short (6 to 16 mm.), dusky,

with straw-colored or yellowish sheaths, laterally divergent, the lowest one stoutest and deflexed: flower salverform, dull brick-red, 3.5 cm. broad.—Type, Thurber 373 in Herb. Mo. Bot. Gard.

"Near Bacuachi, Sonora."

Specimens examined: SONORA (*Thurber* 373).

94. Opuntia acanthocarpa Engelm. Syn. Cact. 308 (1856).

Erect and arborescent, stout, 15 to 18 dm. high, with reticulate wood, and few alternate (never verticillate) ascending divaricate branches: joints cylindrical, 10 to 20 cm. long, 2.5 cm. in diameter, with oblong-linear tubercles 18 to 20 mm. long: pulvini with short wool and scanty bristles: spines 8 to 25, stellate-porrect in every direction, with straw-colored or brownish sheaths, the inner (1 to 7) 2.5 to 3 cm. long, the outer (6 to 20) 8 to 20 mm. long: flowers copper-color and small: fruit depressed-subglobose, broadly umbilicate, tuberculate, with rather few but stout spines, 2.5 cm. long: seeds sharply angular, 5 to 6 mm. broad, with broad commissure. (*Ill.* Pacif. R. Rep. iv, t. 18, f. 1–3; t. 24, f. 11: N. Am. Fauna, no. vii, t. 7, 8)—Type, Bigelow of 1854 in Herb. Mo. Bot. Gard.

From southwestern Utah and southern Nevada southward through Arizona and southeastern California into Sonora.

Specimens examined: ARIZONA (*Bigelow* of 1854; *Palmer* (numerous numbers) of 1867; *Engelmann & Palmer; Rusby* 622 of 1883, Peach Spring; *Smart* 245; *Toumey* of 1892, Tucson): CALIFORNIA (*Coville & Funston* 1943, Death Valley Exped.): SONORA (*Thurber* 4, near "Bacuacha"): also growing in Mo. Bot. Gard., 1893.

Among Toumey's specimens is one with spineless fruit, but evidently this species. In such a case the flowers and seeds are necessary to separate it from *arborescens*.

+ + Wood dense: joints slender, obscurely tuberculate: spines single (or 1 or 2 smaller ones added above): seeds more or less margined.

95. Opuntia kleiniæ DC. Rev. Cact. 118 (1828).

Opuntia wrightii Engelm. Syn. Cact. 308 (1856).

Erect and shrubby, 6 to 12 dm. high, 2.5 to 3.5 cm. in diameter below, with few ascending branches: joints cylindrical, slender, 8 mm. in diameter, with elongated depressed tubercles 14 to 18 mm. long, and elongated subulate spreading leaves 10 mm. long: pulvini with white wool and very slender penicillate bristles: the single spine (rarely 1 or 2 smaller divergent ones added above) porrect or a little deflexed, 16 to 20 mm. long, reddish to ashy, with straw-colored deciduous sheaths: flowers brick-red, 2.5 to 3 cm. broad: fruit obovate, about 1.5 cm. long.—Type unknown.

From the Pecos region of Texas to El Paso, and southward through Coahuila and Sonora to southern Mexico.

Specimens examined: TEXAS (*Wright* of 1851 and 1852; *Parry* 49; *Evans* of 1891): COAHUILA (*Palmer* 376): also cult. in Mo. Bot. Gard. 1862 and 1881, and growing in 1893.

96. Opuntia arbuscula Engelm. Syn. Cact. 309 (1856).

Erect and arborescent, 21 to 24 dm. high, the smooth green trunk 10 to 12.5 cm. in diameter, very capitate-branching at apex (top formed by numerous slender divaricate branches): joints lightly tuberculate, the ultimate ones 5 to 7.5 cm. long, 8 mm. in diameter, with oblong-linear depressed (flat and indistinct) tubercles 12 mm. long: pulvini with white wool, and few very slender penicillate bristles: the single spine (or sometimes 2 side by side) porrect, at length deflexed, with straw-colored or yellow sheath, 18 to 25 mm. long, rarely 1 or 2 shorter and lower deflexed ones added: flowers greenish-yellow tinged with red, 3.5 cm. broad: fruit "bristly."—The type specimens are those of Schott ("on desert heights, near Maricopa village, on the Gila"), but they could not be found in the Engelmann collection.

Deserts of Southwestern Arizona and southward into Sonora.

Specimens examined: ARIZONA (*Emory* of 1846; *Engelmann* of 1880; *Parry* of 1881; *Pringle* of 1881, mesas near San Xavier Mission; *Evans* of 1891, Tucson; *Toumey* of 1892, Mesa City; *Wilcox* of 1894, Fort Huachuca).

The Evans specimen contains fruit which is clavate, strongly tuberculate and bristly, with funnelform umbilicus, 2 to 2.5 cm. long. It is immature, so that no color is indicated, and probably not the full size. This species is often confused with the *leptocaulis* forms, but its dense, stouter, almost interlocking apical branches, its long flat tubercles, and its yellowish sheathed spines separate it easily. There is great variation in spine characters, the following forms occurring: naked (spines probably deciduous); one spine (the common form); 2 equal spines side by side; 2 prominent spines and 1 or 2 smaller ones; 3 or 4 spines, all alike but only 5 to 15 mm. long, making a short spiny-looking joint. Some of these forms might have been separated as varieties, but almost all of them, certainly the most diverse ones, have been found on different branches of the same plant. The pulvini are apt to be quite bristly, and the wool is oftener dirty-white than bright-white.

97. Opuntia leptocaulis DC. Rev. Cact. 118 (1829).
Opuntia fragilis frutescens Engelm. Pl. Lindh. 245 (1845).
Opuntia frutescens Engelm. Wisliz. Rep. 28 (1848).
Opuntia frutescens brevispina Engelm. Syn. Cact. 309 (1856).
Opuntia leptocaulis brevispina Watson, Bibl. Index, 407 (1878).

Erect and frutescent, 9 to 15 dm. high, 2.5 to 3.5 cm. in diameter, with light-gray scaly bark and erectish branches ("like pipestems"): joints cylindrical, 4 to 6 mm. in diameter, with indistinct tubercles 6 to 10 mm. long, the young joints sessile: the mostly single spine slender, 8 to 12 mm. long, in a close sheath: flowers greenish or sulphur-yellow, 14 to 20 mm. broad: fruit obovate, smooth, often proliferous, not tuberculate, deep-scarlet, fleshy, 10 to 18 mm. long: seeds few, white, compressed, with narrow and often acute margin, 3 mm. in diameter. (*Ill.* Pacif. R. Rep. iv, t. 20, f. 4, 5; also t. 24, f. 16–19)—Type unknown.

Common from northern Mexico, throughout Texas, and westward to Arizona; also extending to southern Mexico,

Specimens examined: TEXAS (*Lindheimer* of 1845; *Wislizenus* of 1847;

Thurber of 1850; *Wright* of 1851 and 1852; *Hall* of 1872, near Austin): NEW MEXICO (*E. A. Mearns* of 1892, Grant Co.): ARIZONA (*Trelease* of 1892; *Toumey* of 1892, Tucson): COAHUILA (*Gregg* 125 and 438; *Palmer* of 1880): SAN LUIS POTOSI (*Parry and Palmer* of 1878): also growing in Mo. Bot. Gard. 1893.

The Lindheimer form described in 1845 is the form with short spines, and is the characteristic form of Texas and northeastern Mexico. The original *leptocaulis* form was described from Coulter's collection, made further south in Mexico.

98. Opuntia leptocaulis stipata, nom. nov.

Opuntia frutescens longispina Engelm. and Bigel. Pacif. R. Rep. iv, 56 (1856), not *O. longispina* Haw. Philos. Mag. 109 (1830).

Young joints stipitate: spines stouter, longer (2.5 to 5 cm.), and in loose sheaths. (*Ill.* Pacif. R. Rep. iv, t. 20, f. 2, 3)—Type, specimens of Bigelow, Wright, and Thurber in Herb. Mo. Bot. Gard.

From the Colorado River of Texas to the Colorado of the West and southward into Sonora, San Luis Potosi, and Lower California.

Specimens examined: TEXAS (*Bigelow* of 1853; *Wright* 421; *Lindheimer* 1872; *Berlandier* 195, 1455, 1828; *Reverchon* 342, Brownwood; *G. R. Vasey* of 1881, El Paso; *Carleton* 410 of 1891, Oldham County; *Evans* of 1891): NEW MEXICO (*Wright* of 1851; *Bigelow* of 1853): ARIZONA (*Bigelow* of 1854; *Schott* of 1855; *Palmer* 93, 98; *Rusby* 146 of 1883, San Francisco Mts.; *Toumey* of 1892, Tucson; *Wilcox* of 1894, Ft. Huachuca): SONORA (*Thurber* of 1851): SAN LUIS POTOSI (*Parry & Palmer* 280): LOWER CALIFORNIA (*Brandegee* of 1889, San Gregorio, Enrique, Agua Dulce): cult. in Mo. Bot. Gard. 1881; also growing in same garden in 1893.

99. Opuntia leptocaulis vaginata Watson, Bibl. Index, 407 (1878).

Opuntia vaginata Engelm. Wisliz. Rep. 16 (1848), in part.

Joints 6 to 8 mm. in diameter, with rather distinct tubercles 12 to 18 mm. long: the large spines 2.5 to 6 cm. long, dark (mostly black), with very loose glistening yellowish or brownish sheaths, and 1 or 2 smaller ones added: fruit tuberculate, yellow: seed 4 to 5 mm. in diameter. (*Ill.* Pacif. R. Rep. iv, t. 24, f. 1; t. 24, f. 13–15)—Type, specimens of Wislizenus in Herb. Mo. Bot. Gard.

From southwestern Texas to Arizona, and southward into Coahuila and San Luis Potosi.

Specimens examined: TEXAS (*Wislizenus* of 1837 and 1846; *Lindheimer* of 1851; *Wright* 421): NEW MEXICO (*Wislizenus* of 1846; *Wright* 1851–52; *Bigelow* of 1853; *E. L. Greene* of 1880): ARIZONA (*Lemmon* 303): COAHUILA (*Gregg* 753): SAN LUIS POTOSI (*Gregg* 568): also cult. in Mo. Bot. Gard., 1850.

The mostly solitary very long spines are porrect, standing out on every side of the slender stems like great thorns. The leaves are usually quite persistent.

100. Opuntia ramosissima Engelm. Amer. Journ. Sci. ser. 2, xiv, 339 (1852).

Opuntia tessellata Engelm. Syn. Cact. 309 (1856).

Very bushy from a stout trunk (2.5 to 7.5 cm. in diameter) with dark

gray scaly bark, 6 to 20 dm. high, with numerous slender divaricate branches: joints slender cylindrical, 6 to 7 mm. in diameter, covered with crowded and depressed-flattened 5- or 6-angled ashy gray tubercles 5 to 6 mm. long: pulvini with wool, but scarcely bristly, unarmed or with a single (rarely double) elongated (3.5 to 5 cm.) porrect or somewhat deflexed spine (rarely a few additional minute ones), which is whitish and yellow to reddish and brown, and in a very loose yellow sheath (contracted at base and firmly adhering to the spine, loose and saccate above): flowers purple, 1 to 2 cm. broad: fruit ovate (contracted at base and apex), with narrow and deep umbilicus, dry and tuberculate, bristly, 18 to 20 mm. long: seeds few, somewhat regular, with thick spongy margin, 3.5 to 4 mm. broad. (*Ill.* Pacif. R. Rep. iv, t. 21, f. 1–7)—Type not found in the Engelmann collection.

Deserts of the Colorado from southern Nevada through southeastern California and western Arizona into Sonora.

Specimens examined: ARIZONA (*Schott* of 1856; *Parry* of 1867; *Bischoff* of 1871; *Palmer* of 1876; *Toumey* of 1892, Yuma): CALIFORNIA (*Parry* of 1852; *Bigelow* of 1854; *Cooper* of 1861; *Wright* of 1882; *Parish Bros.* 170 of 1882, San Bernardino Mts.; *Trelease* of 1892): SONORA (*Schott* of 1855; *Pringle* of 1884, sandy plains, near Gulf of California).

The original name *ramosissima* (1852) was considered an unsuitable one in a section in which all the species are branching; it was therefore changed to *tessellata* (1856), referring to the curious crowded and angular flattened tubercles. The spines are crowded together at the upper end of each year's growth, and these with their yellow shining sheaths surmounting very slender branches covered with scale-like tubercles give the plant a striking appearance. The spines have a wide range of coloration, since they may be not only whitish to yellow (the usual colors), but having always a yellowish tip, they may be ashy-gray or deep reddish-brown, or even black below or sometimes a combination of all of these colors.

** * * Stem erect but weak and using a support, branching and woody: spines none: flowers yellow.*

101. Opuntia rotundifolia Brandegee, Zoe, ii, 21 (1891).

Erect and slender, weak and branching, 20 to 30 dm. high, supported by bushes, with a cylindrical woody stem only, 1 to 1.5 cm. in diameter: joints 6 to 10 cm. long, with fleshy round ovate leaves 2 to 3 cm. long and wide: pulvini remote, with gray wool, numerous retrorsely barbed, usually reddish-brown, bristles 3 to 5 mm. long, and no spines: flowers yellow, about 4 cm. broad: fruit slender-clavate, bristly, about 5 cm. long and 4 to 6 mm. in diameter: seeds few, whitish and flattened, densely covered with white hairs (somewhat deciduous with age).—Type in Herb. Brandegee.

"Not uncommon at low elevations in the Cape Region," Lower California.

Specimens examined: LOWER CALIFORNIA (*Brandegee* of 1890, San José del Cabo).

The specimens I have examined are presumably a part of the type material. They consist of naked terete stems 3 to 5 mm. in diameter, with the small tomentose

areolæ averaging about 2 cm. apart; and a package of fragmentary material. The remarkable broad fleshy leaves are very much shrunken, but in their shriveled state measure 10 to 17 mm. long and wide. Mr. Brandegee has seen "the whole plant covered with a mass of thick green leaves, amongst which a few yellow flowers were visible." Such leaves are naturally suggestive of *Peireskia*. The single flower in the material before me is small, about 2 cm. high and broad, but it may be quite immature and is certainly much shrunken. I have not seen the remarkable hairy seeds.

ARTIFICIAL KEY TO THE SPECIES.

It seems impossible to make a satisfactory artificial key for *Opuntia*, as the species are separated, poorly at best, by a variety of characters. The following attempt may be of some service. The numbers refer to the serial numbers of the synoptical presentation:

I. Joints flat and more or less round.—Platopuntias.

* *Spineless.*

Mexico.
microdasys (44), rufida (45).
Florida and tropical America.
ficus-indica (3).
Atlantic States.
opuntia (42).
Southwestern United States.
Joints obovate.
lævis (4), basilaris (46), utahensis (57).
Joints obovate to orbicular.
filipendula (30), mesacantha (31), treleasii (48).

* * *Spiny.*

Florida and Georgia.
pes-corvi (43).
Mexico.
stenopetala (1), setispina (29).
Lower California.
tapona (13), pycnantha (16), comonduensis (21).
Western United States.
Joints neither obovate nor orbicular.
Spines yellow or straw-color.
tuna (5), palmeri (15), rubrifolia (19), fragilis (60).
Spines white or whitish.
trichophora (55), brachyarthra (61).
Spines reddish or brownish.
rutila (58), fragilis (60), brachyarthra (61).
Joints orbicular.
Spines mostly 1 to 3.
Spines reddish-brown (at least some of them).
macrocentra (22), oplocarpa (39), sphærocarpa (56).
Spines whitish (perhaps reddish at base or apex).
filipendula (30), mesacantha (31), cymochila (35).
Spines straw-colored.
cyclodes (10).
Spines mostly 4 to 15 and dark.
strigil (2), mojavensis (27), hystricina (49), polyacantha (50), watsoni (54).

Western United States—Continued.
Joints obovate.
Spines straw-colored.
lindheimeri (7), chlorotica (12), procumbens (18), angustata (20).
Spines white or whitish (sometimes dusky at base or apex).
Spines mostly 1 to 3.
Longest spines not exceeding 3.5 cm.
dulcis (8), occidentalis (9), mesacantha (31), stenochila (36), macrorhiza (37).
Longest spines about 5 cm.
angustata (20), filipendula (30).
Spines mostly 4 to 10.
Longest spines not exceeding 3.5 cm.
albispina (53), arenaria (59).
Longest spines 6 to 10 cm.
tortispina (26), tenuispina (28), hystricina (49).
Spines reddish or brown to black.
Spines mostly 1 to 3.
Longest spines not exceeding 3.5 cm.
lindheimeri (7), greenii (38), vaseyi (40), fusco-atra (41).
Longest spines 5 to 7.5 cm.
procumbens (18), phæacantha (23), camanchica (25).
Spines mostly 4 to 15.
Longest spines not exceeding 3.5 cm.
strigil (2), arenaria (59).
Longest spines about 5 cm.
procumbens (18), platycarpa (51), borealis (52).
Longest spines 6 to 10 cm.
phæacantha (23), camanchica (25), hystricina (49).

II. Joints cylindraceous, more or less tuberculate.—Cylindropuntias.

** Spineless.*

ramosissima (100), rotundifolia (101).

*** Spiny.*

+ Spines without sheaths.

Longest spines not exceeding 1 to 3.5 cm.
bulbispina (62), parryi (63), clavata (64), pulchella (65).
Longest spines 5 to 6 cm.
grahami (66), emoryi (67), schottii (68), invicta (70).

+ + Spines with sheaths.

Mexico.
tunicata (72), imbricata (89), thurberi (93).
Lower California.
clavellina (71), ciribe (73), molesta (91), calmalliana (92).
Southwestern United States.
Spines mostly 5 to 20.
Fruit spiny.
Longest spines not exceeding 2 to 2.5 cm.
echinocarpa (75), serpentina (79).
Longest spines 3 to 3.5 cm.
davisii (74), bernardina (80), acanthocarpa (94)
Fruit not spiny.
Longest spines not exceeding 1.5 to 2.5 cm.
bigelovii (85), whipplei (86), versicolor (90).
Longest spines 3 to 3.5 cm.
prolifera (82), fulgida (83), arborescens (88).

Spines mostly solitary.

Longest spines not exceeding 1 to 2.5 cm.

kleiniæ (95), arbuscula (96), leptocaulis (97).

Longest spines 5 to 6 cm.

stipata (98), vaginata (99), ramosissima (100).

GEOGRAPHICAL DISTRIBUTION.

The genus *Opuntia* is far more largely represented in the United States than any other genus of *Cactaceæ*, extending into British Columbia and to the Atlantic Seaboard and displaying a maze of forms in the Southwestern States. This is specially true of PLATOPUNTIA. The great uncertainty as to the species of *Opuntia* is probably accountable for the large enumeration of them peculiar to our flora. Numerous forms have never been recognized a second time, and others are kept distinct from each other and from Mexican forms when they should doubtless be merged. In almost every unvisited locality "new species" are found so freely that no confidence can be placed in our conception of specific lines in this genus. The following discussion is based upon the presentation of the previous pages, but it should be understood that it must be largely modified by a fuller understanding of the genus.

The two sections, PLATOPUNTIA and CYLINDROPUNTIA are so distinct from each other that they will be considered separately.

CYLINDROPUNTIA, with 28 forms enumerated as belonging to our flora, but 11 of which are restricted to the United States, does not extend north of central Colorado or east of Texas. It is preeminently a Sonoran and Lower Californian type, and 25 of the 28 forms occur in the desert region of western Arizona and southern California. Of the 17 forms in common with the Mexican flora 15 are now traced into Sonora and Lower California, and the others certainly will be. Further exploration of those Mexican States will doubtless reduce the number of species now enumerated as peculiar to our flora. The 11 forms regarded at present as endemic are distributed as follows: *echinocarpa parkeri*, *serpentina*, and *bernardina* in southern California, and doubtless of Lower Californian origin; *whipplei spinosior* and *versicolor* in southern Arizona, certainly to be found in Sonora; *parryi*, *clavata*, and *pulchella* more isolated in southern Nevada and adjacent regions; *davisii* extending from southern California to southern Colorado and northwestern Texas; and *grahami*, a low-ground species, found along the Rio Grande bottoms from El Paso downward, and *schottii*, found as yet only in Texas between the San Pedro and Pecos, the two species of our endemic Cylindropuntias which do not indicate a lower Californian or Sonoran connection.

The seventeen Cylindropuntias in common with Mexico are, with two exceptions, all found in the desert regions of southern California and Arizona, some of them extending into Nevada, others further eastward into Utah and Colorado, and some reaching Texas. They occur in two types, the more robust and more spiny forms (such as *echinocarpa*, *proli-*

fera, *fulgida*, and *arborescens*), and the more slender and less spiny forms (of which *leptocaulis* may be taken as a representative). Exclusive of varieties, there are nine representatives of the former group and four of the latter. In the first series, *bulbispina* has as yet been reported only from New Mexico, extending southwestward into Coahuila. The remaining eight species are massed in Arizona and extend beyond it as follows: *prolifera* only into adjacent California, occurring in the Lower Californian flora; *fulgida* and *bigelovii*, both Sonoran and Lower Californian in origin, extending not only into adjacent California, but reaching southern Nevada; *echinocarpa*, *whipplei*, and *acanthocarpa* having the same extension into California and Nevada, but also reaching southern Utah; *emoryi* and *arborescens* not extending westward or directly northward of Arizona, but stretching eastward to southwestern Texas, the latter being the only one of the group to reach Colorado. Of the four slender and less spiny species *kleinia* has been reported only from southwestern Texas, but its occurrence in Sonora as well as Coahuila would indicate a wide Mexican range and the great probability that it occurs in Arizona. In the case of the other three species *arbuscula* is found only in southwestern Arizona; *ramosissima* extends into adjacent California and southern Nevada; while *leptocaulis*, the most common species, extends eastward from Arizona into Texas, even as far as the Colorado River.

PLATOPUNTIA is represented in our flora by 51 forms, one of which (*tuna*) is a tropical American form extensively introduced by cultivation, notably in southern California. Of the remaining 50 forms, 44 are described as endemic, but 5 being regarded as identical with Mexican forms. It is hard to avoid the conclusion that this is more an expression of our ignorance of the Mexican forms and of specific limitations than of a fact. Three species occur east of the Appalachians: *ficus-indica*, reaching Florida from the tropics; *pes-corvi*, a curious endemic species of Georgia and Florida; and *opuntia*, the common coast species from Massachusetts to Florida. The remaining 47 forms are characteristic of our western flora, but 10 of them ranging north of Colorado or east of Indian Territory. Just as Arizona is the center of our display of Cylindropuntias, so western Texas and adjacent New Mexico are the special home of Platopuntias, 29 of the 47 forms occurring there. PLATOPUNTIA is characterized by the development of three very strong types which display a bewildering maze of forms, viz: *lindheimeri*, *mesacantha*, and *polyacantha*. The species *lindheimeri*, of Mexican origin, ranges through our southern border, from the Gulf to the Pacific, while two of the varieties, *occidentalis* and *littoralis*, are confined to southern California, and the other two, *dulcis* and *cyclodes*, belong to Texas, the latter reaching into adjacent New Mexico. The two other types, *polyacantha* and *mesacantha*, are far wider in their distribution. The type *polyacantha* is not found in the Arizona-California-Nevada region, but ranges far north, extending from Texas into

British Columbia, this and *fragilis* being the only PLATOPUNTIA forms north of our border. The species *polyacantha* extends from Indian Territory and northern New Mexico through Utah to Montana and Washington; *borealis* is the most northern variety, ranging from South Dakota and Oregon into British Columbia; *platycarpa* extends from Utah and Colorado to Idaho and Montana and eastward to Nebraska; *watsoni* extends from New Mexico to Utah, Wyoming, and Nebraska; *albispina* extends from New Mexico to Utah and Indian Territory; while the peculiar *trichophora* is confined to the El Paso region of Texas and adjacent New Mexico. It would seem that in this case a strong type has spread far northward and has been extensively modified. In the case of *mesacantha*, however, we find our most variable type. It is easy to define at least nine varieties of it, but there still remain numerous forms unworthy of varietal rank and still not strictly typical. Its range is wider even than that of *polyacantha*, occupying the Arizona region and extending east of the Mississippi, in fact closely represented on the Atlantic by *opuntia*, but, so far as known, not extending into British Columbia. The species *mesacantha* ranges from Texas to Minnesota, extending eastward into Indiana and Kentucky, its variety *microsperma* accompanying it. The variety *macrorhiza* has the most northwestern extension, reaching the "Big Bend" of the Missouri from Texas and Arizona. The form *cymochila* has a range second in extent only to *macrorhiza*, touching the species in Kansas and reaching Utah and Arizona to the west. The remaining six varieties are far more restricted: *parra* in southern Missouri; *grandiflora* on the Brazos in Texas; *oplocarpa* in western Texas and Colorado; *greenii* in Colorado and Arizona; *stenochila* in western New Mexico; and *vaseyi* in western Arizona. The only other far northern species is *fragilis*, which begins at the south in southern Colorado and adjacent New Mexico and Utah, and extends northward into Montana and British Columbia, and eastward to Kansas and Minnesota. The species *tortispina* has an eastern range along the plains, extending from northern Texas to Nebraska. The remaining 23 forms are purely southwestern, as follows: *fusco-atra* is a form of eastern Texas; *strigil*, *filipendula*, *tenuispina*, and *arenaria* belong to the El Paso region; *sphærocarpa* and *phæcantha major* are restricted to New Mexico; *palmeri*, *rubrifolia*, and *sphærocarpa utahensis* are forms of Utah; *lævis* is peculiar to Arizona; *mojavensis* and *treleasii* are restricted to southern California; *chlorotica*, *basilaris*, and *rutila* belong to the desert region of southern California, Arizona, Nevada, and Utah; *angustata* and *hystricina* extend from southern California to New Mexico, the latter also reaching Nevada; *procumbens* and *camanchica* extend from Arizona to the El Paso region of Texas, the latter also reaching southern Colorado. The total enumeration of Platopuntias in the southwest shows 20 forms in Texas, 17 in New Mexico, 14 in Arizona, 11 in southern California, 11 in Utah, and 7 in Colorado. But 4 species are reported as yet from Nevada, but this is evidently entirely inadequate.

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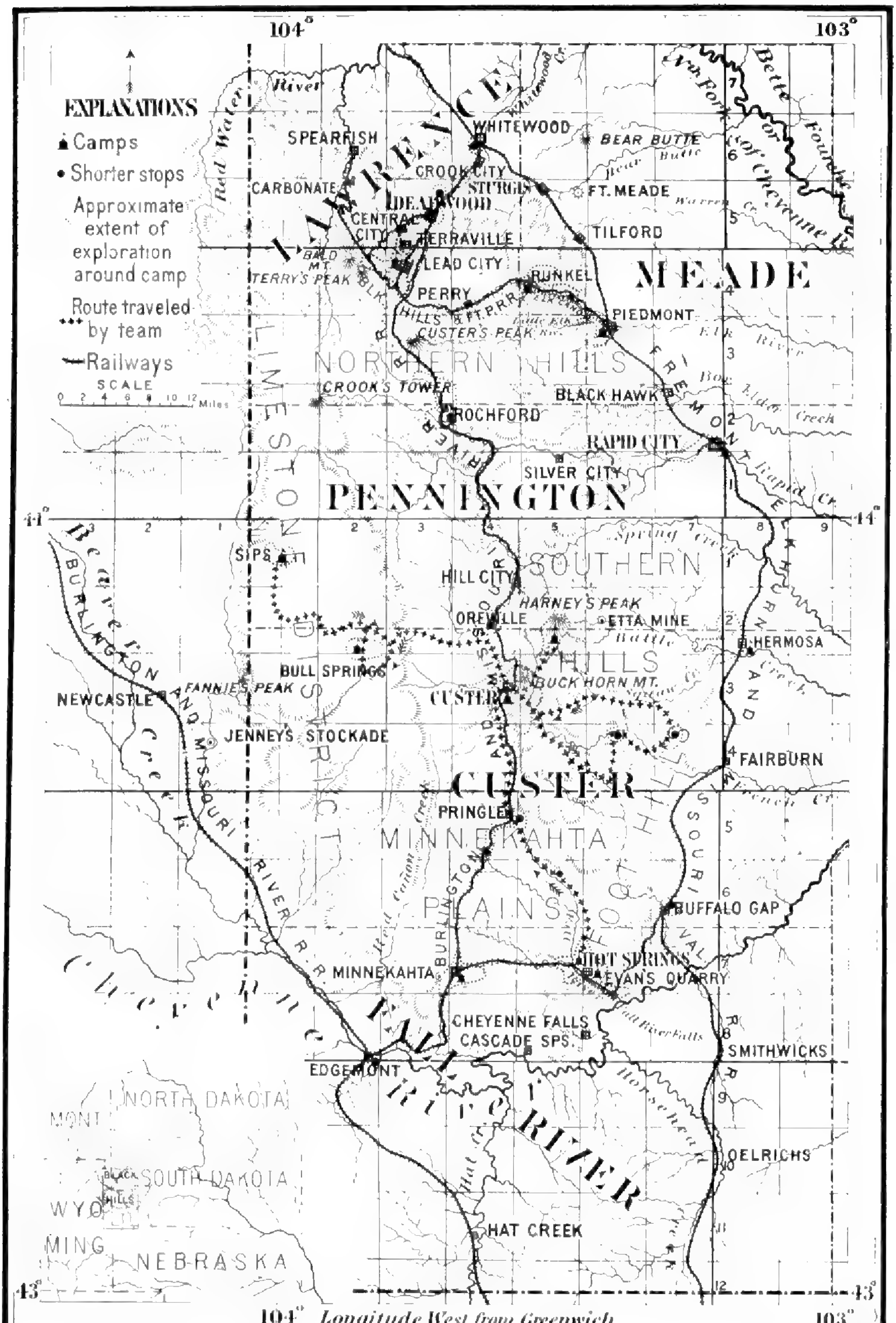

MAP OF THE BLACK HILLS.

U. S. DEPARTMENT OF AGRICULTURE.

DIVISION OF BOTANY.

CONTRIBUTIONS

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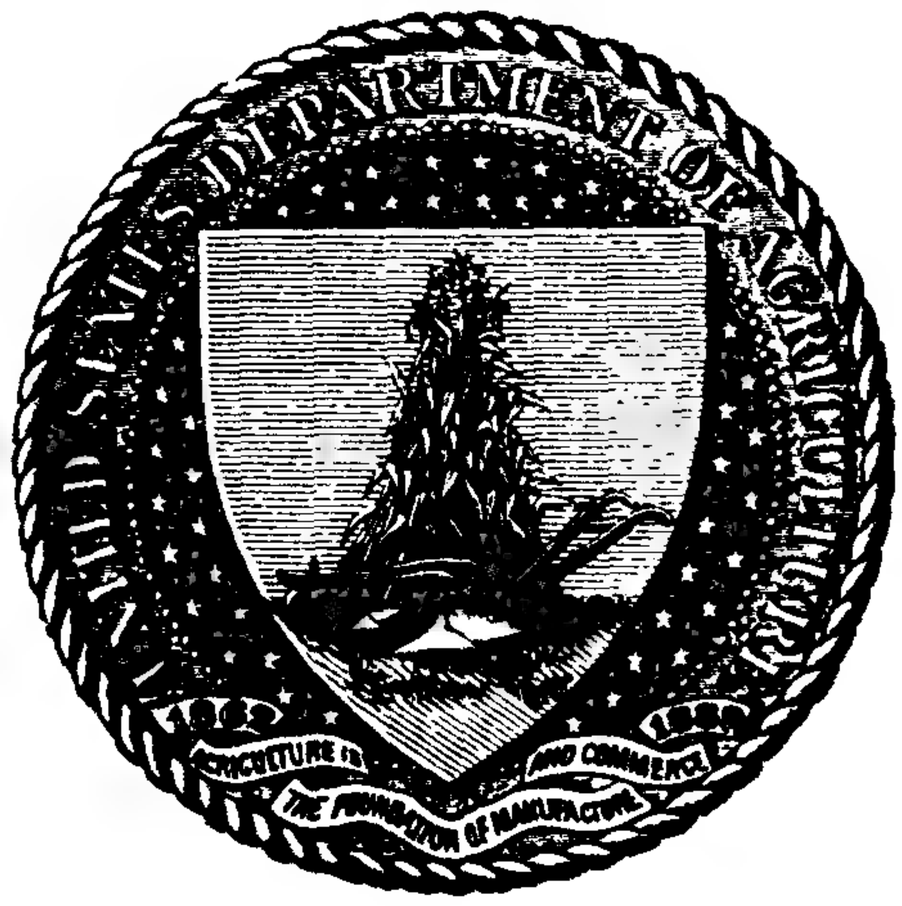
FLORA OF THE BLACK HILLS OF SOUTH DAKOTA.

BY

P. A. RYDBERG.



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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF BOTANY,
Washington, D. C., February 14, 1896.

SIR: I have the honor to transmit herewith, for publication as Contributions from the United States National Herbarium, Volume III, No. 8, a report entitled "Flora of the Black Hills of South Dakota," by Mr. P. A. Rydberg. This report is based upon a botanical exploration made in that region by Mr. Rydberg in 1892, as a field agent of the Department of Agriculture.

Respectfully,

FREDERICK V. COVILLE,
Botanist.

HON. J. STERLING MORTON,
Secretary of Agriculture.

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FLORA OF THE BLACK HILLS OF SOUTH DAKOTA.

By P. A. Rydberg.

ITINERARY.

On May 26, at noon, I left Lincoln by the Burlington and Missouri River Railroad to spend three months in the Black Hills of South Dakota. A few days before, I had received a commission from the United States Department of Agriculture as an agent of the Division of Botany for the purpose of making an investigation of the flora of the Black Hills. Up to July 3, I was accompanied by Mr. A. E. Wagner, a graduate student of the University of Nebraska. In the morning of May 27 we arrived at Edgemont, where the railroad crosses the Cheyenne River. I availed myself of frequent opportunities to collect along the railroad track. Arriving at Custer, which point was taken as the base of operations, being about the center of the Hills, we remained there until June 7, collecting in all directions from 4 to 6 miles from town; but the number of plants in flower was not large. On July 7 we moved our camp to an artificial body of water (Sylvan Lake) in the mountains not far from Harneys Peak. On June 10 we returned to Custer and took the train for Hot Springs, where we stayed, collecting, till June 21. Then taking the Fremont, Elkhorn, and Missouri Valley Railroad we followed the eastern foothills up to Elk River, stopping on the way at the following places: Buffalo Gap, June 21; Hermosa, June 22 to 24; Rapid City, June 25 to 26; and Piedmont, June 27 to 29.

On the morning of June 29 we bought tickets on the Black Hills and Fort Pierre Railroad to Runkels, but stepped off the train at Jones, making our way up the remaining length of the famous Elk Canyon on foot. We remained at Runkels through the next day, removing to Lead City the morning of July 1, at which point my camp remained till July 9. Mr. Wagner set out on his return to Lincoln July 3. From this base I visited the region around Deadwood, July 5; Whitewood, July 7; and Terrys Peak, July 8. On the 9th of July, I took the Burlington and Missouri River Railroad south, stopping at Rochford July 9 to 13, and

at Custer July 13 to August 1. From the latter point I visited Oreville on July 17; Sylvan Lake and Harneys Peak, July 18 to 21; made a drive of 22 miles down French Creek July 22 and 23, and one into the Limestone District near the Wyoming line, July 25 to 30, extending probably 30 to 35 miles northwest of Custer.

On August 1, I moved my camp to Minnekahta, visiting Pringle on the 6th. I then joined a party of naturalists from the University of Nebraska, in whose company I remained for the rest of the season. We camped at Hot Springs till August 11, when we moved to Custer. From this point, after visiting the Harneys Peak region on August 17 to 18, we returned to Lincoln on August 22.

GEOGRAPHY.

The Black Hills are on the boundary line between South Dakota and Wyoming, the larger part lying within the former State. The center is a little east of the intersection of the forty-fourth parallel and one hundred and fourth meridian. The Black Hills constitute an isolated range about 120 miles long north-northwest and south-southeast, and 40 to 50 miles wide east and west. A little northwest of the Black Hills and separated from them only by the narrow valley of the Belle Fourche, is another much smaller spur, the Little Missouri Mountains, evidently belonging to the same range. The nearest mountains except those mentioned are the Big Horn Mountains to the west and the Laramie Mountains to the southwest. These are at a distance of 150 to 200 miles and separated from the Black Hills, the former by the valleys of the Little Missouri and Powder rivers, the latter by those of the Cheyenne and North Platte. There are no mountains to the north, east, or south.

Not only are the Black Hills an isolated range, but the surrounding high table-land is deeply cut on all sides by the branches of the Cheyenne River. The head of Inyankara Creek is due west of the center of the Hills. The creek runs in a northwesterly direction till it empties into the Belle Fourche. This runs northeast and then southeast, emptying into Cheyenne River. The bend is north of the range. Not far from the head of the Inyankara are the springs of Beaver Creek, a stream which flows south into Cheyenne River. The latter runs south of the Hills, then changes its course to northeast till it joins the Belle Fourche, and finally empties into the Missouri River.

GEOLOGY.

In order to compare the geological and floral districts of the Black Hills I give a summary of the geology of the region derived from the report by Henry Newton on the Geology and Resources of the Black Hills of Dakota.[1]

[1] U. S. Geog. and Geol. Survey of the Rocky Mountain Region, 1880.

Mr. Newton gives a synopsis of the strata of the Black Hills, of which the following is a short abstract:

Ages.	Feet.	Strata.
Cenozoic:		
Miocene	200	Clays and conglomerates.
Cretaceous	900	Clays and shales; sandstone.
Mesozoic:		
Jura	200	Clays and marls, with some limestone.
Red Beds	340	Red clay.
Carboniferous	690	Sandstones and limestones.
Paleozoic:		
Silurian (Potsdam)	250	Silicious sandstones and conglomerates.
Archæan (?)		Slates and schists, with intrusive granite.

Of these the Mesozoic and Paleozoic strata are resting conformably upon each other, the Cenozoic and Archæan are not. The Black Hills have been formed by the uprising of the Archæan rocks, which lifted up and broke through the overlying strata. That this uprising must have taken place after the Cretaceous and before the Miocene formations can be seen from the fact that the strata of the latter do not conform with those of the former.

The Black Hills have received their present form by erosion. The softer rocks have worn away faster, leaving the harder standing out as ridges or crags. As the center is raised, the dip of the strata is outward and the outcroppings form concentric ovals. The Jurassic clays and marls, the clays of the Red Beds and the slates and schists of the Archæan formation are comparatively soft, while the Cretaceous sandstone and the granite spurs of Archæan formation are hard. The Miocene formation belongs to the surrounding plains and does not enter the Hills anywhere.

The outcrop of the Cretaceous sandstone forms the foothills, and that of the Jura formation and the Red Beds makes the so-called "Race Track," a more or less continuous valley between the foothills and the hills proper. The Race Track is much broader on the south side and forms the larger part of the "Minnekahta Plains." On the east side the Carboniferous limestone belt forms a series of hills, and on the west side, where the strata are nearly horizontal, a broad plateau, the "Limestone District." As the slates and schist are comparatively soft, the center of the Black Hills is lower, except where the granite or igneous rocks come to the surface and form the highest peaks in the range.

ALTITUDES.

The plains at the base of the Black Hills have an altitude of about 1,000 meters. The highest point is the top of Harneys Peak, one of the series of granite crags at about the center of the Hills. Its altitude is given differently. The most reliable measurements are without doubt those given by the United States Geological Survey, one of which makes it 7,368 feet, the other 7,440 feet, or, respectively, 2,245

and 2,267 meters. The people in the neighborhood insist upon calling it 8,000 feet. Next in height comes Crooks Tower, the highest point on the Limestone Plateau on the west side, with the altitude of 7,325 feet, or 2,232 meters. The altitude of Terrys Peak, one of the igneous cones in the Northern Hills, is 7,215 feet, or 2,200 meters, and Custers Peak, another igneous cone in that neighborhood, is slightly lower. The general height of the Black Hills is between 1,500 and 2,000 meters.

PRECIPITATION AND TEMPERATURE.

The precipitation of the Black Hills is very large compared with that of the surrounding country. There are no records of the annual rainfall in that part in which, judging from the nature of the flora and the luxuriant growth of the vegetation, the precipitation must be the largest, viz, in the Harney Mountain Range. In fact, there are no records from any place in the higher part of the Black Hills.

Table showing the average monthly and annual precipitation at the Weather Bureau stations in the Black Hills, compared with that of four stations on the plains and three stations within the Rocky Mountain region.

Station.	Altitude in meters.	Year.	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.
Deadwood, S. Dak	[1]1,411	1878–87	1.25	1.21	1.99	5.17	4.65	3.73	2.84	2.23	1.06
Spearfish, S. Dak	1,140	1889–91	1.22	1.33	1.22	2.67	3.06	5.18	2.86	1.44	.89
Rapid City, S. Dak	973	1881–84, 1888–91	.45	.83	1.16	2.03	4.30	3.91	2.14	1.59	.74
Fort Meade, S. Dak	[2]1,057	1879–91	.73	.63	1.07	2.38	4.02	3.22	2.40	1.96	.56
Fort Robinson, Nebr	1,150	1883–91	.50	.67	1.24	1.65	2.93	2.01	2.04	1.94	.53
Sidney, Nebr	1,248	1872–80, 1886–91	.52	.47	.93	1.37	2.83	1.08	2.55	2.06	1.33
Fort Fetterman, Wyo	1,512	1868–82	.46	.67	1.19	1.68	2.51	1.26	1.59	.96	1.14
Fort Keogh, Mont	721	1881–90	.72	.53	.46	.81	2.10	2.75	.83	1.19	.79
Helena, Mont	[1]1,399	1866–69, 1880–87	1.73	.63	.70	1.57	1.50	2.47	.97	.74	1.37
Georgetown, Colo	2,586	1886–90	.42	.39	.74	1.29	1.75	.78	2.08	1.72	.70
Colorado Springs, Colo	1,821	1871–90	.20	.26	.46	1.72	2.26	1.69	3.45	2.14	1.28

Station.	Altitude in meters.	Year.	Oct.	Nov.	Dec.	Annual.	Greatest during any year.		Least during any year.	
							Year.	Inches.	Year.	Inches.
Deadwood, S. Dak	[1]1,411	1878–87	1.58	1.26	1.51	28.48	1882	33.83	1880	19.20
Spearfish, S. Dak	1,140	1889–91	1.44	.53	1.14	22.68	1891	26.32	1890	20.73
Rapid City, S. Dak	973	1881–84, 1888–91	.51	.35	.45	18.46	1888	22.75	1890	14.02
Fort Meade, S. Dak	[2]1,057	1879–91	.68	.48	.46	18.59	1883	27.05	1885	13.25
Fort Robinson, Nebr	1,150	1883–91	1.50	.57	.71	16.29	1887	25.25	1886	11.08
Sidney, Nebr	1,248	1872–80, 1886–91	.78	.39	.24	14.55	1879	26.92	1890	7.61
Fort Fetterman, Wyo	1,512	1868–82	1.00	.80	.86	14.13	1871	17.86	1876	9.45
Fort Keogh, Mont	721	1881–90	.72	.37	.25	11.52	1891	14.18	1883	9.07
Helena, Mont	[1]1,399	1866–69, 1880–87	1.13	1.17	1.17	15.95	1866	22.14	1882	10.32
Georgetown, Colo	2,586	1886–90	.89	.78	.57	12.11	1891	16.42	1890	11.72
Colorado Springs, Colo	1,821	1871–90	.56	.37	.31	14.72	1872	18.56	1888	9.12

[1] The altitudes of Deadwood and Helena are those of the signal stations at those places. For the other places the altitudes of the railroad tracks at the stations are given.
[2] The altitude given for Fort Meade is that of Sturgis, the nearest point whose altitude is accessible.

The above table, which is an abstract from the records of the United States Weather Bureau, shows the average monthly and annual pre-

cipitation, given in inches, for four places in the region. Of these, Rapid City and Fort Meade are just outside the foothills, Spearfish in a canyon in the first range, and only Deadwood within the Hills proper; but the last is neither at a very great altitude nor even near the part that has the greatest precipitation. The table shows an increase of about 2 inches in the average annual precipitation for every 100 meters in altitude. If the precipitation of the higher parts of the Black Hills should be calculated on that basis, which would obviously be incorrect since many other meteorological conditions must be taken into consideration, the annual rain and snow fall around Custer would be about 32 inches and that of the Harney Mountains about 40 inches or more, and still I do not think these figures are overestimated. The signs are unmistakable that the precipitation of the region around Harneys Peak is much larger than that at Deadwood. The more luxuriant growth of the vegetation, notwithstanding the higher altitude, the great abundance of plants that need a humid climate, as for instance ferns, mosses, liverworts, and lichens, and the innumerable streams that originate there, show that the precipitation of the southern Hills must be greater than that of the northern.

For comparison I have included in the table the precipitation of four stations situated on the table-land between the Black Hills and the Rockies, and also of three stations within the Rocky Mountain region. It can be seen at a glance that the comparison is favorable to the Black Hills. It would be naturally anticipated that the precipitation would be greater here than on the nearly treeless plains, but that it should be so much greater than in the places cited in the Rockies is more unexpected. It is intimated that the rains from the Gulf of Mexico do not reach the Rocky Mountains, and that the rains in that region come from the west. A place situated on the east side of the mountain, as is the case with the three stations given, would receive very little rain, as the moisture would be combed out by the mountains.

Whatever the cause, the precipitation of the Black Hills is greater than that of certain places in the Rockies, as can also be seen from the table. The situation of Colorado Springs is similar to that of Rapid City or Fort Meade, and that of Georgetown or Helena can be compared with that of Deadwood. Even on the top of Pikes Peak, which takes away the rain from Colorado Springs, the precipitation is not greater than that of Deadwood, and I am sure that it would stand low in comparison with that of the Harney Mountains, if any records had been made at the latter place.

Table showing the average monthly maximum, mean, and minimum temperatures at the Weather Bureau stations in the Black Hills and the mean temperature at four stations on the surrounding plains.

Station.	Year.	Temperature.	Jan.	Feb.	Mar.	Apr.	May.	June.	July.	Aug.	Sept.
			°	°	°	°	°	°	°	°	°
Deadwood, S. Dak. (altitude, 1,411 meters).	1878–87	Maximum	52	57	64	70	77	89	91	91	82
		Mean	21	23	32	40	50	60	65	65	54
		Minimum	−17	−16	3	16	27	39	44	41	31
Rapid City, S. Dak. (altitude, 973 meters).	1881–83, 1888–91	Maximum	57	60	69	82	84	95	99	100	94
		Mean	20	22	33	46	53	64	71	71	61
		Minimum	−18	−23	−2	13	27	41	46	45	34
Fort Meade, S. Dak. (altitude of Sturgis, 1,057 meters).	1879–91	Maximum	53	62	68	80	85	94	98	100	91
		Mean	18	21	31	44	54	65	71	70	59
		Minimum	−22	−25	−6	15	27	39	45	41	31
Fort Robinson, Nebr. (altitude, 1,150 meters).	1883–91	Mean	21	24	34	48	57	67	73	70	61
Sidney, Nebr. (altitude, 1,248 meters).	1872–80, 1886–91	Mean	21	26	32	43	53	66	73	70	59
Fort Fetterman, Wyo. (altitude, 1,512 meters).	1868–82, 1890–92	Mean	24	28	33	43	55	67	74	70	56
Fort Keogh, Mont. (altitude, 721 meters).	1878–92	Mean	11	16	32	47	56	67	74	72	60

Station.	Year.	Temperature.	Oct.	Nov.	Dec.	Average annual mean.	Highest maximum and lowest minimum.		Average range.	Greatest range.
							Degrees.	Date.		
			°	°	°	°			°	
Deadwood, S. Dak. (altitude, 1,411 meters).	1878–87	Maximum	74	62	54	.....	102	July, 1881	108	134
		Mean	44	33	23	42	.....	.....		
		Minimum	18	−1	13	.....	−32	Feb., 1883		
Rapid City, S. Dak. (altitude, 973 meters).	1881–83, 1888–91	Maximum	78	71	64	.....	106	July, 1881	123	146
		Mean	48	34	31	46	.....	.....		
		Minimum	22	3	−5	.....	−40	Feb., 1883		
Fort Meade, S. Dak. (altitude of Sturgis, 1,057 meters).	1879–91	Maximum	80	68	61	.....	108	July, 1881	125	145
		Mean	48	33	24	45	.....	.....		
		Minimum	16	5	−13	.....	−37	Dec., 1887		
Fort Robinson, Nebr. (altitude, 1,150 meters).	1883–91	Mean	49	36	29	47	.....	.....	.....	.....
Sidney, Nebr. (altitude, 1,248 meters).	1872–80, 1886–91	Mean	47	33	24	46	.....	.....	.....	.....
Fort Fetterman, Wyo. (altitude, 1,512 meters).	1868–82, 1890–92	Mean	45	33	25	46	.....	.....	.....	.....
Fort Keogh, Mont. (altitude, 721 meters).	1878–92	Mean	46	31	19	44	.....	.....	.....	.....

From the accompanying table, also an abstract from the Weather Bureau records, but with the fractions omitted, it can be seen that the average temperature of the stations at the base is about the same as that of the surrounding plains. At Deadwood it is a few degrees lower, a decrease of about 1 degree for each 100 meters increase of altitude, and very likely in the higher hills the average temperature is much lower. The maximum heat is reached in August, the average being 100° F. in the foothills and 91° F. at Deadwood, but sometimes reaching higher, as seen in the table. The minimum is reached in February or January, being −25 and −23 degrees in the foothills, but only −17 degrees at Deadwood, probably on account of the more protected locality. The average difference between the maximum and minimum in a

year or the range of variation is given in the tables; so also the difference between the highest maximum and the lowest minimum reached during the whole period of observation.

FLORAL DISTRICTS.

Relatively to the differences in topographical and climatic conditions and in vegetation, the Black Hills may be divided into five districts: Foothills, Minnekahta Plains, Harney Mountain Range, Limestone District, Northern Hills.

These districts do not coincide with the outcroppings of the different geological formations. They receive, however, their most prominent physical features from that formation which is best represented within the region, as for instance, the Minnekahta Plains from the Red Beds, the Limestone District from the Limestone Plateau, the Harney Range from the granite crags.

FOOTHILLS[1] AND SURROUNDING PLAINS.

The foothills are capped by the comparatively hard cretaceous sandstone. The plains outside the foothills are mostly covered by the overlying Miocene conglomerates and clays. In the canyons, along the water courses, and in other depressions the underlying thin Jurassic strata of clays and marls and the Red Beds are exposed. Although the foothills constitute the outcropping of an older formation their flora is essentially the same as that of the surrounding table-lands, which extend as valleys far in among the hills. The flora depends more on meteorological conditions than on the geological formation. As shown above, the annual rainfall at Rapid City, which is among the foothills, is much less than that of the Black Hills proper. In fact the conditions are much the same as in western Nebraska and eastern Wyoming. It is a dry region, with most of the rain falling in the spring, and a season of drought in July and August. A majority of the plants peculiar to the high, dry plains of Nebraska, Wyoming, and neighboring States were also found here. Most of these plants are endowed with characters that in one way or another reduce the evaporation to a minimum. These characteristic plants may be divided into the following groups:

(1) Very hairy plants, in many cases covered with a thick pannose pubescence. Such are:

Eriogonum flavum.
Eriogonum annuum.
Eriogonum multiceps.
Eriogonum pauciflorum.
Astragalus gilviflorus.
Eurotia lanata.
Plantago purshii.
Senecio canus.
Senecio plattensis.
Evolvulus nuttallianus.
Filago prolifera.
Spiesia lambertii sericea.
Artemisia frigida.

[1]The western foothills are in Wyoming. The work was confined to South Dakota, and hence this includes only the eastern foothills.

(2) Plants with a glaucous foliage having a hard epidermis:

Agropyron repens glaucum.
Elymus canadensis glaucifolius.
Yucca glauca.
Zygadenus venenosus.
Rumex venosus.
Adorium tenuifotium.
Argemone alba.
Viola nuttallii.

(3) Plants with white, often shreddy, stems:

Œnothera pallida.
Œnothera albicaulis.
Mentzelia decapetala.
Mentzelia nuda.
Mentzelia oligosperma.

(4) Plants in which the surface is reduced to a minimum, either by a special habit, as in the species of Opuntia and Cactus, or by the leaves being narrow and involute, as in the following:

Calamovilfa longifolia.
Lygodesmia juncea.
Carex filifolia.
Carex stenophylla.

(5) Plants with a deep-seated, enlarged root:

Ipomœa leptophylla.[1]
Psoralea esculenta.

Many of the plants belonging to the Dry-plain flora, and supposed to be of more southern or western range, extend into the foothills. Among these may be mentioned:

Jacksonia trachysperma.
Astragalus plattensis.
Astragalus racemosus.
Astragalus spatulatus.
Astragalus gracilis.
Astragalus microlobus.
Chenopodium fremonti incanum.
Psoralea cuspidata.
Adorium tenuifolium.
Peucedanum villosum.
Erigeron canus.
Erigeron flagellaris.
Croton texensis.
Sedum stenopetalum.

In many places in western Nebraska and South Dakota and eastern Wyoming there are no visible streams. The superfluous water is drained off by means of "sand draws." A sand draw is a subterranean stream. On the surface is seen only a broader or narrower band of pure sand, marking the channel. The water may sometimes be running 5 meters below the surface. Sand draws are found here or there among the foothills, but their place is mainly taken by the numerous streams running down from the hills. Many of these streams sink, however, and become sand draws before they reach Cheyenne River. Many plants either from the Black Hills proper or from the Missouri Valley have spread along the water courses. Among those which have ascended the streams may be mentioned:[2]

Ranunculus macounii.
Roripa nasturtium.
Œnothera sinuata.
Pentstemon grandiflorus.
Prunella vulgaris.
Polygonum lapathifolium.

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[1] At the State University of Nebraska there is a root preserved which, in its dry state, is three-fourths of a meter long and 3.5 decimeters in diameter.

[2] Plants ranging across the continent or found as well in the Mississippi Valley as in the Rocky Mountains are mostly omitted.

Besides these most of the woody vegetation of the region, as:

Vitis vulpina, frost grape.
Populus deltoides, cottonwood.
Ulmus americana, elm.
Prunus virginiana, chokecherry.
Fraxinus pennsylvanica lanceolata, green ash.
Quercus macrocarpa, bur oak.
Salix fluviatilis, willow.
Ostrya virginiana, ironwood.
Cratægus macrantha, hawthorn.
Parthenocissus quinquefolia, Virginia creeper.
Acer negundo, box elder.
Prunus americana, plum.
Fraxinus pennsylvanica, red ash.
Salix cordata, willow.
Rosa woodsii, rose.
Celtis occidentalis, hackberry.
Celastrus scandens, woody bittersweet.

The last two in each column are local, having been observed only at one station each, viz, at Rapid City, Hot Springs, Hermosa, and Piedmont, respectively. The following have descended from the Black Hills proper.

Growing in canyons:

Populus tremuloides, quaking aspen.
Cornus baileyi, dogwood.
Berberis aquifolium, Oregon grape.
Salix bebbiana, willow.
Populus angustifolia, black cottonwood.

On the hills:

Pinus ponderosa scopulorum, Rocky Mountain yellow pine.

The following woody plants may be regarded as belonging to the region itself, that is, to the flora of the high plains and foothills:

Juniperus virginiana, red cedar.
Prunus demissa, western chokecherry.
Rhus trilobata, skunk brush.
Ribes cereum, squaw currant.
Ribes aureum, buffalo currant.
Rosa arkansana, prairie rose.

As objects of peculiar interest seen in this region may be mentioned a shrub of skunk brush, which had stems 3 meters high and one decimeter in diameter, a cottonwood that measured over 5.5 meters in circumference, 1.5 meters above ground, and had a branch below that height nearly 2 meters around, and another cottonwood on which all the leaves had a cuneate base. *Populus acuminata* was also rediscovered near Hot Springs.

Differently from the Black Hills proper the foothills are not covered by forest. Some of them are crowned by scattered pines mixed with a few cedars. The hills as well as the valleys are generally covered with grass. The principal grasses are:

Bouteloua oligostachya.
Bouteloua hirsuta.
Koeleria cristata.
Calamovilfa longifolia.
Bulbilis dactyloides.
Carex filifolia.
Andropogon scoparius.

With the exception of the last in each column they furnish good winter as well as summer pasture. The cattle and horses generally "range" the year around, and are often not given any hay except during snowstorms or other bad weather. The first four plants mentioned become self-cured during the dry season and are as good as hay. On

account of the small rainfall and the season of drought, farming, as a rule, is not paying and the settlers have been forced to rely on stock raising. The little hay needed is cut along the streams. The principal hay grasses are:

Panicum virgatum.
Agropyrum repens glaucum.
Elymus canadensis.
Elymus virginicus.
Poa nemoralis.
Andropogon provincialis.
Phalaris arundinacea.
Calamagrostis canadensis.
Calamagrostis neglecta.
Panicularia nervata.

At Hot Springs a new Poa was found, described in this report under the name of *Poa pseudopratensis*, and here also *Savastana odorata* occurred.

MINNEKAHTA PLAINS.

The Minnekahta Plains are not plains such as we find in central Nebraska, but a high, rolling table-land, between the foothills to the south and the Harney Range to the north. Geologically they are made up of two formations. The southern part is an expansion of the so-called "Race Track" produced by the outcropping of the Red Beds, which is here wider than in any other part of the Hills.[1] As the vegetation nowhere fully covers the ground the whole landscape receives a peculiar reddish color. In the northern part the underlying carboniferous limestone comes to the surface. As the strata are lying comparatively undisturbed in their natural relation, the surface is less rugged than in other parts of the Black Hills, and there is here little difference in surface condition between the limestone formation and the Red Beds south of it, except in the color of the soil.

The Minnekahta Plains are crossed by the Burlington and Missouri River Railroad from a few miles south of the Minnekahta station to Pringle, where the road enters the mountain range. The plains are covered with grass and are mostly used as pastures, but part is under cultivation. The region seems to suffer somewhat from drought. I collected there in August, but found very little of interest. Woody plants were scarce. On the hills grew some pines, dwarf sumacs or skunk brush, and sand cherries; in the draws some box elders, cottonwoods, gooseberries, and plums. Among herbs of interest there occurred two stragglers from the South, viz: *Asclepias verticillata pumila*, and *Acerates auriculata*, and the following were abundant on the railroad embankment:

Amaranthus blitoides.
Setaria viridis.
Solanum triflorum.
Saponaria vaccaria.

Beside the common upland grasses, a few of special interest were collected, viz: *Poa fendleriana*, *Sporobolus heterolepis*, *Danthonia spicata*. The first is of a more western range and the others are from the East. All three were found in the neighborhood of Pringle. Otherwise the flora was much the same as in the foothills.

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[1] On the east side it is narrow and its flora does not differ from that of the foothills.

HARNEY MOUNTAIN RANGE.

The only really mountainous part of the Black Hills is between Pringle and Hill City, on the Burlington and Missouri River Railroad. Especially is the Harney Range, between Custer and the latter place, of a truly mountainous character. This district is a series of high, naked cliffs and crags, rising from 500 to 1,000 meters over the valleys, intermixed with smaller hills. The looser slates and schists of the Archæan age have worn and washed away, leaving the harder granite rocks standing out as gigantic prongs of the most fantastic shapes. In many cases the streams have hollowed out deep ravines and gulches. Where the granite rocks are less common broad valleys have been formed, which are often called "parks." The most important are Custer Park around the upper part of French Creek, Dodge Park around the heads of Red Canyon Creek, and Elk Prairie on the Upper Spring Creek.

The hills and the sides of the mountains are covered with woods, the valleys are open, rich grass lands, here and there under cultivation. The principal tree is the Rocky Mountain yellow pine (*Pinus ponderosa scopulorum*), the only tree that grows abundantly enough to make a forest. Lumbermen distinguish two varieties, in which I could see only individual variation. On the north side of the mountains, and even on the south side of the Harney Mountains at an elevation of about 900 meters above the level of French Creek and between 540 and 580 meters above the sea, there is also found spruce, but not, as one would expect, any of the Rocky Mountain species. It is the northern white spruce (*Picea canadensis*). But how did it come to the Hills? The pines have probably come from the west, from the Rockies, over the Big Horn or the Laramie mountains, and the hills of Wyoming. The deciduous trees have crept up the tributaries of the Cheyenne River. The spruce, which grows only in the highest part of the Hills could not have done either. The nearest point in the Rockies from which I have seen the white spruce reported is about 100 miles farther north and 400 or 500 miles farther west, viz, in the valley of Blackfoot River in western Montana. There are no high mountains north of the Black Hills, and the spruce apparently is not found growing anywhere else in the Dakotas or eastern Montana. Neither does it grow in the two mountain ranges named above nor in the Yellowstone National Park. It must have come to the Black Hills in prehistoric times, when Dakota had a colder climate and the woods extended over the plains, or else seeds must have been brought there by migratory birds. The juniper, a nearly prostrate form of *Juniperus communis*, is common on the knolls, but the red cedar *J. virginiana* is very rare. I saw only two stunted shrubs on the Buckhorn Mountains near Custer.

Of the deciduous trees there are:

Betula papyracea, canoe birch.
Betula occidentalis, western black birch.
Populus tremuloides, quaking aspen.
Salix bebbiana, willow.
Salix discolor, willow.
Salix cordata, willow.

Farther down along Squaw Creek occurred:

Quercus macrocarpa, bur oak.
Ulmus americana, white elm.

Among shrubby plants may be mentioned:

Cornus stolonifera, dogwood.
Ribes setosum, gooseberry.
Ribes oxycanthoides, gooseberry.
Ribes cereum, squaw currant.
Ribes lacustre, swamp currant.
Shepherdia canadensis, Canadian Shepherdia.
Amelanchier alnifolia, juneberry.
Corylus rostrata, hazel.
Opulaster opulifolius, nine-bark.
Opulaster monogynus, nine-bark.

The known range of the following Rocky Mountain plants is extended by their discovery in the Black Hills on this trip:

Actæa spicata arguta.
Viola canina adunca.
Epilobium paniculatum.
Epilobium drummondii.
Dodecatheon pauciflorum.
Aconitum fischeri.
Leucocrinum montanum.
Arenaria verna hirta.
Aster sibiricus.
Arnica alpina.
Pyrola rotundifolia bracteata.
Myosotis sylvatica.
Wulfenia rubra.
Astragalus aboriginum glabriusculus.
Helianthemum majus.

Of eastern or northeastern plants collected in this region may be mentioned:

Viola palustris.
Viola blanda.
Lobelia spicata hirtella.
Stachys aspera.
Hypericum canadense.
Tetragonanthus deflexus.
Fragaria virginiana.
Solidago erecta?

The most remarkable "find," however, was that of the true *Aquilegia brevistyla* in the United States. The Rocky Mountain plant, so named, proves to be a distinct species and has received the name *A. saximontana.*

As I have said before, the valleys are rich grass land. Even the dryer ones furnish a good pasture and along the water courses are excellent hay lands. One of the men accompanying the geological survey under Jenney, named "California Joe," expressed himself, "There's gold from the grass roots down but there's more gold from the grass roots up." Around Custer, the place to which the first great rush of gold hunters was directed, stock raising or farming seems to be more profitable than gold digging.

In a meadow near French Creek the grass stood 1 meter high. The most common grasses were:

Panicularia nervata.
Agrostis alba.
Poa nemoralis.
Alopecurus geniculatus fulvus.
Calamagrostis canadensis.
Calamagrostis dubia.
Agropyron repens glaucum.

In a slough I found *Spartina cynosuroides*, *Beckmannia erucæformis*, and *Panicularia americana.* In a glen below Sylvan Lake were found

two eastern grasses, *Oryzopsis juncea* and *O. asperifolia*. Near the railroad occurred two forms of *Poa nevadensis*, and *Bromus pumpillianus*, both of a more western range. On a wooded hill, together with the three common Stipas, *S. spartea*, *S. comata*, and *S. viridula*, grew a fourth, *S. richardsonii*, of a more western range, and also *Danthonia spicata*, from the East.

But the most peculiar feature of this region is the damp atmosphere. The Harney Range differs in that respect from the Northern Hills. On account of this dampness, and differently from mountain regions in general, the Harney Range abounds in lichens, liverworts, mosses, and ferns, especially on the north side of the crags, where the rocks in many places are literally covered by lichens and the base and crevices lined by mosses and ferns. The lichens and mosses were collected only incidentally, but a good collection of ferns was made. My list contains the following from this region:

Polypodium vulgare.
Asplenium trichomanes.
Asplenium filix-fœmina.
Phegopteris dryopteris.
Woodsia oregana.
Botrychium matricariafolium?
Polypodium vulgare rotundatum.
Pteris aquilina.
Asplenium septentrionale.
Dryopteris filix-mas.
Cystopteris fragilis.
Woodsia scopulina.
Selaginella rupestris.

LIMESTONE DISTRICT.

The Limestone District is a high table-land, running from south to north, on the Wyoming line. It is separated from the Harney Range and the other hills by a valley. This table-land is the watershed of the Black Hills, giving rise to Spearfish, Rapid, French, and Red Canyon creeks on the east side, and Red Water, Inyankara, and Beaver creeks on the west side. The plateau is 1,800 to 2,000 meters high, the highest point, Crooks Tower, being, next to Harney Peak, the highest in the hills. The surface is made up of pine-covered ridges running north and south. The valleys between these ridges are composed of excellent hay land. The region resembles much some parts of Sweden. The pine-covered hills were here, so also the meadows with the knee-deep grass, and the flowers were in greater profusion and greater variety of color than I have seen elsewhere in America. The Swedish species were seldom present, but they had their counterparts: *Hieracium*, *Scorzonera*, and *Hypochœris* were matched by *Rudbeckia hirta*, *Gaillardia aristata*, and *Helianthus maximiliani*; *Lathyrus* and *Vicia* by *Lupinus parviflorus* and *L. sericeus*; *Geranium sylvaticum* by *Geranium richardsonii*; *Chrysanthemum leucanthemum* by *Aster ptarmicoides*; and *Solidago virgaurea* by *Solidago missouriensis*. In the border of the woods the same old *Epilobium angustifolium* presented itself.

The only trees seen in the district were the pine and the quaking aspen.

Of shrubs were observed:

Salix bebbiana.
Ribes cereum.
Shepherdia canadensis.
Ceanothus fendleri.
Salix discolor.
Juniperus communis.
Eleagnus argentea

The Ceanothus has hitherto been reported only from southern Colorado and southward.

Other remarkable plants were:

Epilobium hornemanii.
Helianthella quinquenervis.
Astragalus convallarius.
Pellaa breweri.
Balsamorhiza sagittata.
Frasera speciosa.
Epilobium drummondii.
Lupinus sericeus.

all from a more western or southern range.

To me this region looked as promising as any in the Black Hills for agricultural purposes. As said before, the valleys were excellent hay lands. The grasses were about the same as those around Custer. The dryer valleys and the woods would furnish enough of summer pasture. During the winter the stock must be fed with hay as the snowfall is very heavy. Sometime after I had visited the region I heard that this was the principal reason why many of the squatters had left the region. The soil was a black loam containing a considerable amount of lime, the valleys were less rough than those of the parks of the preceding region and could easily be made into fields.

NORTHERN HILLS.

The Northern Hills, notwithstanding their great height, look more like hills than mountains. Even the highest, as Terrys Peak, Custers Peak, etc., are covered with woods to the top. The larger part of the region is the northern half of the Archæan formation. As said before this is composed of comparatively soft slates and schists. The rivers have worn out deep canyons, many volcanic eruptions have thrown up cones of igneous rocks, and the remainders here and there of the broken strata of Potsdam sandstone and Carboniferous limestone make the country more uneven. The woody flora resembles that of the Harney Range, but the pine is more predominant. The elm is lacking in this region and the oak is confined to the foothills and neighboring canyons. The following shrubs and climbers may be added.

Ceanothus ovatus.
Potentilla fruticosa.
Vitis vulpina.
Viburnum lentago.
Lonicera hirsuta glaucescens.
Parthenocissus quinquefolia.

The whole region seems to have been one large pine forest; but now large tracts are made bare by the ravages of lumbermen, mining companies, fire, and cyclones, nothing being left but stumps, fallen logs, and the underbrush. The second forest will consist of deciduous trees, as aspen, willows, birch, and cherry. The mining resources of the Hills, especially around Lead City and Deadwood, are well known. The

Black Hills and Fort Pierre Railroad was built by the Homestake Mining Company, principally for the purpose of transporting wood and lumber to their mines and stamp mills, and other roads have been built by other companies. Sawmills are scattered all over the Hills, and it will be no wonder if in a short time the dark pine forest is gone and the name "Black Hills" has become meaningless.

The valleys of this region are very narrow, and in that small part in which I collected, little of their natural condition was left. The Elk Canyon in many places was just wide enough to give room for the creek and the railroad. The nearly perpendicular sides were as much as 200 to 300 meters high. Around Lead City and Deadwood railroads and wagon roads wind through the narrow valleys, and the small patches of grass left are well cropped down by the town cows. At Rochford only I found a good meadow. The grasses were the same as in the other regions of the hills, but the blue grasses were more common. The following grasses may be mentioned as of special interest:

Oryzopsis micrantha.
Bromus pumpellianus.
Avena striata.
Elymus dasystachys.

from Elk Canyon.

Calamagrostis sylvatica americana.
Panicum depauperatum.
Agropyron violaceum majus.
Festuca ovina.

from the neighborhood of Lead City.

The Northern Hills, especially the canyons, contain more Eastern as well as Western plants than any other part of the hills. Among those not given in Coulter's Manual, which is supposed to cover all the territory west of the one hundredth meridian, are:

Viola scabriuscula.
Lathyrus ochroleucus.
Tetragonanthus deflexus.
Lappula virginiana.
Polygala senega latifolia.
Naumburgia thyrsiflora.
Lappula deflexa americana.

Of Western plants were found:

Thalictrum occidentale.
Claytonia perfoliata amplectens.
Lupinus sericeus (?).
Potentilla glandulosa.
Epilobium drummondii.
Arnica cordifolia.
Hieracium fendleri.
Frasera speciosa.
Mimulus luteus.
Potentilla humifusa.
Thalictrum venulosum.
Lupinus parviflorus.
Spiræa cæspitosa.
Heuchera parvifolia.
Osmorrhiza nuda.
Arnica alpina.
Vaccinium myrtillus microphyllum.
Mertensia sibirica.
Calochortus gunnisoni.
Lesquerella spatulata.

Among the most interesting finds was a patch of caraway, *Carum carui*, which I found in the wilderness 3 or 4 miles north of Deadwood. Perhaps some German or Scandinavian gold hunter had happened to drop a piece of old country cheese spiced with the customary caraway seed, and hence the patch.

GENERAL REMARKS.

From the foregoing can be seen what a varied flora the Black Hills have. There are found plants from the East, from the Saskatchewan region, from the prairies and table-lands west of the Missouri River, from the Rocky Mountains, and even from the region west thereof. In the foothills and the lower parts of the Hills proper the flora is essentially the same as that of the surrounding plains, with an addition of Eastern plants which have ascended the streams. In the higher parts the flora is more of a Northern origin. Most of the plants composing it are of a more or less transcontinental distribution but often characteristic of a higher latitude. Some can be said to belong to the Rocky Mountain region. The only trees of Western origin are *Pinus ponderosa scopulorum*, and *Betula occidentalis;* the others are Eastern or transcontinental. The flora resembles therefore more that of the region around the Great Lakes than that of the Rockies.

The collection contains a little over 700 Phænogams and Fernworts. This is certainly far from all that grow in the region. A few more known to occur in the Black Hills could have been added to the list, as for instance, *Mentzelia oligosperma* and *Ilysanthes gratioloides*, collected by Mr. A. F. Woods; *Onoclea sensibilis* and *Aster salsuginosus*, by Prof. T. A. Williams; *Fritillaria linearis*, by Miss Pratt, of Piedmont; and *Sorbus sambucifolia*, by Mr. Runkel, the owner of the sawmills at Runkels. *Viburnum prunifolium* was also reported by a physician of Custer, but perhaps *V. lentago* was mistaken for it. A squatter told me that he had cut hickory poles on the Squaw Creek, a statement which seems doubtful. Jenney, in his report on the Geological Survey of the Black Hills, reports the black spruce and mulberry as growing in the hills. The former probably was confounded with the white spruce, and the occurrence of the latter needs verification.

To the following botanists acknowledgements are due for help in the determination of the species. The Carices have been determined by Prof. L. H. Bailey, the genera Epilobium and Gayophytum by Dr. William Trelease, Polygonum by Mr. J. K. Small, Salix by Mr. M. S. Bebb. The determinations of Juncaceæ, Gramineæ, and Umbelliferæ have been verified by Mr. Frederick V. Coville, Prof. F. Lamson-Scribner, and Mr. J. N. Rose, who have also made a few corrections where needed. The desciption of *Poa pseudopratensis* is drawn by Professor Scribner.

In the identification of the collection, the plants have been compared with specimens in the National Herbarium and the herbarium of the University of Nebraska. Thanks are also due to Prof. N. L. Britton, of Columbia College, and Prof. John Macoun, of Ottawa, Canada, for the loan of specimens for comparison.[1]

[1]The acknowledgments expressed, p. 148 of this volume, footnote 1, are also here renewed.

CATALOGUE OF SPECIES.

RANUNCULACEÆ.

Clematis scottii Porter; Port. & Coult. Fl. Col. 1 (1874).

The specimens in this collection are like those collected by Dr. Scoville in Colorado, but not like those obtained by Lemmon in Arizona, which undoubtedly belong to a distinct species. Coulter, in the Manual of the Rocky Mountain Region, describes the sepals as less hairy than those of *C. douglasii*. In mine they are fully as hairy, but thicker and shorter.

On hillsides near Hot Springs, altitude 1,060 m., June 1, 17; in fruit, August 2 (No. 481).

Clematis ligusticifolia Nutt.; Torr. & Gray, Fl. i, 9 (1838).

In canyons among the foothills: Hot Springs, altitude 1,050 m., August 2 (No. 482).

A form with large (5 to 7 cm. long) and dullish leaflets and very long (15 to 22 cm.) and slender peduncles, was collected on the very steep sides of Hot Springs Canyon, near the Chautauqua grounds, altitude 1,050 m., August 3 (No. 483).

Clematis alpina tenuiloba (Gray).

Gray[1] makes this a subvariety of *C. alpina occidentalis* Gray, which is described as having smooth achenes. In my specimens they are silky. The plant further differs from *C. alpina ochotensis* or *occidentalis* in having more delicate stems, smaller and more lobed leaves with more rounded lobes and sinuses, and longer, lanceolate sepals. This plant has been collected also by Dr. Chas. E. Bessey at Manitou, Colo. It was sold in albums of Black Hills flowers at Deadwood under the name of *C. douglasii*. Perhaps the silkiness of the achenes was the cause of this error.

Here and there in canyons, in the Black Hills proper, near Piedmont, altitude 1,200 m., June 27; Lead City, altitude 1,600 m., July 6; Bull Springs, in the Limestone District west of Custer, altitude 1,900 m., July 27 (No. 484).

Pulsatilla hirsutissima (Pursh) Britton, Ann. N. Y. Acad. vi, 217 (1891); *Clematis hirsutissima* Pursh, Fl. i, 385 (1814).

Common in the Hills: Custer, altitude 1,650 m., May 28, 31, June 4 (No. 485).

Anemone multifida Poir. Encyl. Suppl. i, 364 (1810).

Not uncommon in the Northern Hills: Elk Canyon, altitude 1,200 m., June 29; Lead City, altitude 1,800 m., July 4; Rochford, altitude 1,700 m., July 11 (No. 486).

Anemone cylindrica Gray, Ann. Lyc. N. Y. iii, 221 (1836).

In the Northern Hills: Hermosa, altitude 1,000 m., June 21; Lead City, altitude 1,700 m., July 6; Rochford, altitude 1,650 m., July 11 (No. 487). Several of the plants have some of the peduncles with secondary involucres. In a few specimens from Elk Canyon, altitude 1,200 m., June 29, the divisions are also broad, and the plants can not be distinguished from *A. virginiana*, except by the very short style (No. 488).

Thalictrum purpurascens L. Sp. Pl. i, 546 (1753).

In canyons, among the foothills: Hot Springs, altitude 1,050 m., June 18; Elk Canyon, altitude 1,200 m., June 29 (No. 489).

Thalictrum occidentale Gray, Proc. Amer. Acad. viii, 372 (1872).

The specimens are rather too young for identification. None were seen in fruit, as I was not in the locality of the plant except in the early part of the summer. The foliage is very like that of *T. occidentale*, and the plant agrees well with the description of that species. If the determination is correct, the range of *T. occidentale* is extended far east.

Elk Canyon, altitude 1,200 m., June 29 (No. 490).

Thalictrum venulosum Trelease, Proc. Bost. Soc. Nat. Hist. xxiii, 302 (1886).

This is *T. dioicum* L., of Newton & Jenney's Report.[2]

The only specimens in fruit seem to be typical. They were collected near Bull

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[1] In Newton & Jenney, Geol. Surv. Black Hills, 531 (1880). [2] Loc. cit., p. 532.

Springs, altitude 1,000 m., July 27. Younger specimens from Little Elk Canyon, altitude 1,100 m., June 29, have somewhat larger and thinner leaves (No. 491).

Batrachium divaricatum (Schrank) Wimm. Fl. Schles. 10 (1841); *Ranunculus divaricatus* Schrank, Baier. Fl. ii, 104 (1789).

The specimens resemble those of my Nebraska collections, except that the peduncles are much shorter.

In brooks: Beaver Creek, near Buffalo Gap, altitude 975 m., June 21; Rapid Creek, above Rapid City, altitude 1,000 m., June 25; Elk Creek, altitude 1,100 m., June 28 (No. 492).

Cyrtorhyncha cymbalaria (Pursh) Britton, Mem. Torr. Club, v, 161 (1894); *Ranunculus cymbalaria* Pursh, Fl. i, 392 (1814).[1]

Around springs; common: Hot Springs, altitude 1,050 m., June 10 (No. 493).

Ranunculus cardiophyllus Hook. Fl. Bor. Amer. i, 14 (1829).

This is not included in Coulter's Manual. The range is hence extended westward. The petals in my specimen are broadly ovate, large, bright yellow, the sepals very pubescent.

Custer, altitude 1,625 m., June 4; Rochford, altitude 1,600 m., July 11 (No. 494).

Ranunculus ovalis Raf. Proc. Dec. 36 (1814).

Not uncommon in shady places: Custer, altitude 1,625 m., May 28. Some specimens resemble somewhat the preceding species in size and habit, but the petals are oblong-rhombic (No. 495).

Ranunculus abortivus L. Sp. Pl. i, 551 (1753).

All specimens collected in the Hills are very slender and with thin leaves. This is especially the case with those from Elk Canyon, altitude 1,200 m., June 29 (No. 496). Those from Runkels, altitude 1,300 m., June 29 (No. 497), are more stout and approach the ordinary form.

Ranunculus sceleratus L. Sp. Pl. i, 551 (1753).

In and near streams: Piedmont, altitude 1,000 m., June 27; Elk Creek, altitude 1,200 m., June 29; Rochford, altitude 1,600 m., July 11 (No. 498).

Ranunculus pennsylvanicus L. f. Suppl. 272 (1781).

Wet places; common: Lead City, altitude 1,500 m., July 6; Custer, altitude 1,650 m., July 15 (No. 499).

Ranunculus macounii Britton, Trans. N. Y. Acad. xii, 3 (1892).

Hooker, in the Flora Boreali-Americana, describes his *R. hispidus* as being erect. Dr. Britton, loc. cit., says:

"This is a spreading or trailing species, not stoloniferous as far as I know." As far as I can judge, there are two forms of this species; one, generally ascending, but sometimes erect, sometimes even spreading, the other widely trailing and stoloniferous. All the specimens from the Black Hills were of the former character, and may be regarded as the typical *R. macounii*, as they answer best the description of *R. hispidus* Hooker, on which *R. macounii* was based.

Very common throughout the Black Hills: Hot Springs, altitude 1,050 m., June 15; Hermosa, altitude 1,050 m., June 23; Lead City, altitude 1,500 m., July 6 (No. 500).

Aquilegia canadensis L. Sp. Pl. i, 533 (1753).

Common: Rapid City, altitude 1,000 m., June 25; Little Elk Canyon, altitude 1,100 m., June 28; Rochford, altitude 1,600 m., July 11 (No. 501).

Aquilegia canadensis formosa (Fisch.) Cooper, Pac. R. Rep. xii, 55 (1860); *Aquilegia formosa* Fisch.; DC. Prodr. i, 50 (1824).

This seems to grade into the preceding, from which it differs in the shorter spur and longer sepals, which are about twice the length of the petals. In my specimens the leaves are larger and more glaucous.

Rare: Elk Canyon, altitude 1,200 m., June 29 (No. 502).

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[1] See remarks on the synonomy of this species, this volume, p. 148 (1895).

AQUILEGIA BREVISTYLA Hook.

Aquilegia brevistyla Hook. Fl. Bor. Amer. i, 24 (1829). PL. XVIII.

This plant is very rare in the United States. Unless the locality given in the sixth edition of Gray's Manual[1] belongs to this plant, the station given below, as far as I know, is the first one recorded in the country. All specimens I have seen from the Rocky Mountains belong to another species, which I have named *A. saximontana*.[2] The original description of *A. brevistyla* is as follows: "Subpubescens, calcaribus incurvis limbo brevioribus, stylis brevioribus inclusis, staminibus corolla subrevioribus." To this Hooker adds, in smaller type: "Caulis foliaque fere omnino ut in *A. vulgare*. Flores duplo minores, cærulei plerumque pubescentes." "*Pistilla* 5. Germina lineari-cylindracea, pubescentia, in stylis apice leniter recurvis sensim attenuata, staminibus brevioribus. Capsulæ 5, unciam longæ, in stylo brevi vix duas lineas longo terminatæ."

This description does not fit the Rocky Mountain plant, as in it neither the stem nor the flower nor the capsule is pubescent, but the plant is perfectly smooth. Neither does the stem nor the leaves resemble those of *A. vulgaris*. The Rocky Mountain plant is more or less cespitose, with many low (1 to 2 dm. high) stems from the caudex, which is covered with old leafstalks. In *A. vulgaris* the stem is tall (4 to 10 dm. or more high) and simple. The leaves are of a firm texture in the latter, the root leaves long-petioled and twice-ternate, the stem leaves on short petioles or subsessile, often simply ternate or simple and 3-lobed. In the Rocky Mountain plant the leaves are thin, all slender-petioled and twice ternate, the upper, however, sometimes reduced. The plants of my collection and specimens of *A. brevistyla* from western British America very much resemble *A. vulgaris*, but differ in their shorter styles, the smaller size of the flowers, and the form of the corolla. In *A. vulgaris* the limb is truncate or retuse, much shorter than the spur, and generally shorter than the stamens. In *A. brevistyla* the limb is oblong, truncate, longer than the short spur and the stamens. The corolla, peduncles, upper part of the stem, and the capsules are in the specimens mentioned, as they should be according to the original description, viz, pubescent.

In nearly all the literature in this country in which *A. brevistyla* is mentioned, the reference is to *A. saximontana* instead. Torrey & Gray's Flora is an exception. Here the description is essentially the same as in Hooker's Flora. In both the distribution of the species is given as "Western part of Canada, as far north as Bear Lake," Gray's Manual, sixth edition, perhaps includes both. All the other descriptions I have seen refer to the Rocky Mountain plant. The best one is given by Marcus E. Jones.[3] This I shall use as the basis for my description of *A. saximontana*, adding such characters as will better show the distinction between this and *A. brevistyla*. Even a comparison between Jones's description (or Porter's in Flora of Colorado, or Coulter's in Manual of Rocky Mountain Region), and the original one in Hooker's Flora will show that they are drawn from different plants.[4]

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[1] Gray, Man. ed. 6, 46 (1890).

[2] See page 482, in footnote.

[3] Zoe, iv, 258, October, 1893.

[4] The North American species of Aquilegia with curved spur may be disposed in the following way:

A. *Stem 4 to 10 dm. high.*

a. *Style in fruit more than 1 cm. long.*

A. VULGARIS L. Sp. Pl. i, 533 (1753).

Limb of the corolla shorter than the spur and the stamens; flowers blue, red, or white. Escaped from gardens.

A. FLAVESCENS Wats. Bot. King. Surv. v, 10 (1811).

Limb of the corolla of the length of the spur but shorter than the stamens;

On dark, wooded hillsides; rare: Little Elk Canyon, altitude 1,200 m., June 28; Oreville, altitude 1,650 m., July 16 (No. 503).

Delphinium bicolor Nutt.; Torr. & Gr. Fl. i, 33 (1838).

Variable. In the collection there are three forms, which probably belong here. One is 4 to 6 dm. high, with most leaves near the base, more or less glandular-pubescent throughout, even to the pods. Custer, altitude 1,650 m., June 3, Aug. 1 (No. 504).

Another form is like this, but perfectly smooth and with thinner sepals; in some specimens the flowers are purplish pink. Runkels, altitude 1,300 m., June 30 (No. 505).

The third is a tall form 7 to 10 dm. high, glandular-pubescent, and with broader, more pointed divisions to the leaves. It is the same as *D. menziesii utahense* Wats.[1] Elk Canyon, altitude 1,200 m., June 29 (No. 1205).

Aconitum fischeri Reich. Monogr. Gen. Acon. i, 22 (1820).

The common American form is a tall plant, generally 1 to 1.5 m. high, robust, pubescent, and viscid. The divisions of the leaves in my specimens, as well as in some

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corolla yellowish, sometimes tinged with red or blue. See M. E. Jones, loc. cit. In the Wasatch Mountains from Utah to British America.

b. *Style in fruit 5 to 7 mm. long.*

A. BREVISTYLA Hook. Fl. Bor. Amer. i, 24 (1829); Torr. & Gr. Fl. i, 30; Walp. Rep. i, 51, etc. (Some of the other references in Wats. Bibl. Index, p. 6, may belong here, as *A. vulgaris?* Richards. App. Frankl. Journ. 740).

Stem 4 to 10 dm. high, simple, pubescent, or glandular above, especially on the peduncles and flowers; root leaves 2-ternate on *stout* petioles; stem leaves diminishing upward, often ternate and short-petioled or the upper simple, 3-lobed and sessile; pedicels stout and recurved; sepals blue, acute; limb of the *petals yellowish white, longer than the blue, curved spur and the stamens;* ovary pubescent; pod 2 to 2.5 cm. long, reticulate and glandular-pubescent.

Western Canada, Red River Valley (?), and the Black Hills. Specimens seen: Canada, Morley (Albertina), 1885, John Macoun; McKenzie River, Louis Anderson; South Dakota, No. 503 of this collection.

B. *Stem 0.5 to 2 dm. high, subcespitose.*

a. *Style in fruit about 0.5 cm. long.*

A. SAXIMONTANA Rydberg; Gray, Syn. Fl. i, pt. 1, 43 (1895); *A. vulgaris brevistyla* Gray, Amer. Journ. Sci. ser. 2, xxxiii, 410, and Proc. Acad. Phila. 1863, 57 (1863), name only; Porter, Port. & Coult. Fl. Col. 4 (1874), description; *A. brevistyla* Coulter, Man. Rock. Mount. Reg. 10 (1885); Jones, Zoe, iv, 258 (1893). PL. XIX.

Stem 1 to 2 dm. high, densely tufted, scarcely exceeding the leaves, perfectly smooth; leaves twice-ternate, all on slender petioles thin, the upper a little smaller; leaflets 8 to 15 mm. long, with long petiolules, pedicels slender, upright; sepals greenish and obtuse or blue and acute; limb of the petals yellow, longer than the blue, curved spur, and the stamens and pistils; ovary smooth; pod 1.5 to 2 cm., smooth.

Rocky Mountains of Colorado. Specimens examined: Colorado, Dr. James (labeled A. cærulea, var. ?); 1861, C. C. Parry, No. 90; 1862, Hall & Harbour, No. 23; 1869, Scoville; Argentine Pass, 1878, M. E. Jones, No. 875; Gray's Peak, 1895, P. A. Rydberg and C. L. Shear.

b. *Style in fruit about 1 cm. long.*

A. JONESII Parry, Amer. Nat. no. 8, 211.

Cespitose, 0.5 to 1 dm. high; leaflets about 0.5 cm. long, nearly sessile; spur nearly straight.

Rocky Mountains of Wyoming and Montana.

[1] Bot. King. Surv. 112 (1871).

AQUILEGIA SAXIMONTANA Rydberg.

from Colorado and Wyoming, are much narrower than in those from the Pacific Slope. Near Terrys Peak, altitude 1,900 m., July 6; Rochford, altitude 1,700 m., July 12 (No. 506).

Specimens, collected among peat moss, below Sylvan Lake, 4 miles south-southwest from Harneys Peak, altitude 2,000 m., July 18 (No. 507) are much smaller, 3 to 6 dm. high, slender, few-flowered, less pubescent, with finer lobes to the leaves and bluer flowers, the hoods of which are more semicircular in outline.

Actæa spicata rubra Ait. Hort. Kew. ii, 221 (1789).

Professor Greene regards this as specifically distinct from *A. spicata*. Perhaps it is so, but the characters pointed out which are to separate *A. spicata* from *A. rubra* are not constant, at least in Scandinavian specimens of the former. Even the fruit is sometimes bright red in them.

Rare: Elk Canyon, altitude 1,200 m., June 29 (No. 508).

Actæa spicata arguta (Nutt.) Torr. Pac. R. Rep. iv, 63 (1856); *Actæa arguta* Nutt.; Torr. & Gr. Fl. i, 35 (1838).

This often has the fruit white and much larger and more elongated than in the red-fruited variety. Perhaps they are distinct, but I could not find any other character that would separate them.

Little Elk Canyon, altitude 1,100 m., July 18; Custer, altitude 1,650 m., August 15 (No. 509).

BERBERIDACEÆ.

Berberis aquifolium Pursh, Fl. i, 219 (1814); *Berberis repens* Lindl. Bot. Reg. t. 1176 (1828).

Without doubt this is the original *Berberis aquifolium* Pursh, and Lindley made a mistake when he supposed that the name belonged to the taller species of the Columbia River basin. Lindley's statement that Pursh's drawing was made from Menzies's plant, that is, the *B. aquifolium*[1] of Hooker and of Lindley, is evidently wrong, as Pursh does not cite Menzies as having collected it. The plate was made from a specimen of Lewis's collection, and it as well as the description shows that the plant belongs to what has been known as *B. repens* Lindley.[2] Sweet, in British Flower Garden, says: "Mr. Lindley's observations on *B. aquifolium* are wrong; the very specimen figured by Pursh is now in his herbarium in Mr. Lambert's collection; the name *B. repens* published in the Bot. Reg. must therefore be disused."

In canyons: Hot Springs, altitude 1,100 m., June 12; Little Elk, altitude 1,200 m., June 28 (No. 510).

PAPAVERACEÆ.

Argemone alba Lestib. Bot. Belg. ed. 2, iii, 133 (1799); *A. albiflora* Hornem. Hort. Hafn. 489 (1813–15).[3]

In draws among the foothills. Hermosa, altitude 1,025 m., July 24; 15 miles east of Custer, altitude about 1,400 m., July 23 (No. 511).

FUMARIACEÆ.

Capnoides aureum (Willd.) Kuntze, Rev. Gen. Pl. i, 14 (1891); *Corydalis aurea* Willd. Enum. 740 (1809).

Rare: Elk Canyon, on the railroad embankment, altitude 1,200 m., June 29 (No. 512).

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[1] This must take the name *Berberis nutkana* (DC.) Kearney, Trans. N. Y. Acad. xiv, 29 (1894); *Mahonia aquifolium nutkana* DC. Syst. ii, 20 (1821).

[2] One leaflet in Pursh's figure (fig. 1) may belong to *B. aquifolium* Hook.; at least this was Watson's view.

[3] See my notes, p. 149 of this volume. Mr. Prain has shown (Journ. Bot. xxxiii, 329) that *P. albiflora* is antedated by *P. alba*. Both are based on specimens from the Southern States. Mr. Prain thinks that the plant of the Western plains is distinct, and names it *A. intermedia*. I can not, however, find any constant character that will separate the two.

Capnoides curvisiliquum (Engelm.) Kuntze, Rev. Gen. Pl. ii, 14 (1891); *Corydalis curvisiliqua* Engelm.; Gray, Man. ed. 5, 62 (1867).

This is not uncommon in the Black Hills: Sylvan Lake, altitude 1,900 m., June 8; Hot Springs, altitude 1,050 m., June 13 (No. 513).

NYMPHÆACEÆ.

Nymphæa advena Soland. in Ait. Hort. Kew. ii, 226 (1789). Leaves of this species were seen in Rapid Creek, 6 miles above Rapid City, but no specimens were secured.

CRUCIFERÆ.

Draba carolinana micrantha (Nutt.) Gray, Man. ed. 5, 72 (1867); *Draba micrantha* Nutt.; Torr. & Gr. Fl. i, 109 (1838).

Barren hills, rare: Hot Springs, altitude 1,100 m., June 13 (No. 514).

Draba nemorosa L. Sp. Pl. ii, 643 (1753).

The specimens of this collection are pubescent even to the pods, and may belong to the variety *hebecarpa* Lindl., but the hairy form has been regarded, by De Candolle and others, as the typical *D. nemorosa* L.

Early in the spring: Custer, altitude 1,650 m., June 1 (No. 515).

Draba aurea Vahl. in Hornem, Fors. Dansk. Œcon. Pl. ed. 2, 599 (1806).

My specimens differ from the common form in being more slender, and in having entire, thin leaves, smaller, paler petals with more slender claw, and longer, decidedly twisted pods. The peduncles and pedicels are ciliate and the sepals narrow. I took it for the variety *stylosa*. It resembles somewhat the original specimens of this, from Fendler's collection; but the pods are much longer and the style shorter. I do not wish to give it a varietal name, as I have specimens from only one locality.

In a shady place, at the foot of a high cliff, below Sylvan Lake, altitude 2,000 m., July 18 (No. 516).

Arabis glabra (L.) Bernh. Verz. Syst. Erf. 195 (1800); *Turritis glabra* L. Sp. Pl. ii, 666 (1753).

Rare: Along the railroad in Elk Canyon, altitude 1,200 m., June 29 (No. 517).

Arabis hirsuta (L.) Scop. Fl. Carn. ed. 2, ii, 30 (1772); *Turritis hirsuta* L. Sp. Pl. ii, 666 (1753).

Common: Custer, altitude 1,650 m., May 30, June 3; Hot Springs, altitude 1,100 m., June 13; Elk Canyon, altitude 1,200 m., June 29. The specimens from the latter place are unusually slender (No. 518).

Arabis holbœllii Hornem. Fl. Dan. xi, t. 1879 (1827).

The flowers in my specimens are seldom reflexed; the pods are a little curved and reflexed.

Common: Custer, altitude 1,650 m., June 5; Elk Canyon, altitude 1,200 m., June 29; Lead City, altitude 1,500 m., July 6 (No. 519).

Arabis holbœllii retrofracta (Graham); *Arabis retrofracta* Graham, Edinb. Phil. Journ. 344 (1829).

The latter has generally been regarded as a synonym of *A. holbœlii*. There seem, however, to be two or three different forms of this species, one of which has more slender pods, which are perfectly straight, and smaller flowers. This agrees with the description of *Turritis retrofracta* in Hooker's Flora Boreali-Americana, Volume I, page 41. The root leaves are spatulate, petioled, the stem leaves sessile, lanceolate, with a hastate, half-clasping base.

Elk Canyon, altitude 1,200 m., June 29 (No. 520).

Stanleya pinnata (Pursh) Britton, Trans. N. Y. Acad. viii, 62 (1889); *Cleome pinnata* Pursh, Fl. ii, 739 (1814).

On prairie, 1 mile east of Fall River Falls, altitude 1,000 m., June 18 (No. 521).

Erysimum asperum (Nutt.) DC. Syst. ii, 505 (1821); *Cheiranthus asper* Nutt. Gen. ii, 69 (1818).

Hot Springs, altitude 1,050 m., June 14; Hermosa, altitude 1,000 m., June 23; Rapid City, altitude 1,000 m., June 26 (No. 522).

A form with slender, twisted pods was collected on the hills north of Deadwood, altitude 1,500 m., July 5 (No. 523).

Erysimum cheiranthoides L. Sp. Pl. ii, 661 (1753).

Hot Springs, altitude 1,050 m., June 14; Rochford, altitude 1,050 m., July 11 (No. 524).

Erysimum inconspicuum (Wats.) MacMillan, Metasp. Minn. Val. 268 (1892); *Erysimum asperum inconspicuum* Wats. Bot. King Surv. 24 (1871).

This resembles very much *E. virgatum* Roth of Europe, and perhaps is only its American form. It was growing together with *E. asperum* and *E. cheiranthoides*, and in the field it seemed as if possibly it might be a hybrid of the two. In pubescence, color, and form of the flowers, and form of the pod it is more like *E. asperum;* the general habit is that of *E. cheiranthoides*, and the size of the flowers intermediate between those of the two.

Hot Springs, altitude 1,050 m., June 13 (No. 525).

Sisymbrium pinnatum (Walt.) Greene, Bull. Cal. Acad. ii, 390 (1887); *Erysimum pinnatum* Walt. Fl. Car. 174 (1788).

This is very variable. Some specimens are more or less canescent and have the seeds plainly in two rows (No. 526); others are smooth or, on the upper parts, glandular and have the seeds apparently in one row, characters that should belong to *S. incisum* Engelm. (No. 527). The two were growing together at Hot Srpings, altitude 1,075 m., June 14.

Brassica alba (L.) Boiss. Voy. Espagne, ii, 239 (1839–45); *Sinapis alba* L. Sp. Pl. ii, 668 (1753).

Railroad embankment, Buffalo Gap, altitude 991 m., June 21 (No. 529).

Brassica sinapistrum Boiss. Voy. Espagne, ii, 39 (1839–45).

Buffalo Gap, altitude 991 m., June 21 (No. 528).

Roripa palustris (L.) Bess. Enum. 27 (1821); *Sisymbrium amphibium palustre* L. Sp. Pl. ii, 657 (1753).

Rare in the region: Rapid City, altitude 1,000 m., June 26 (No. 530).

Roripa nasturtium (L.) Rusby, Mem. Torr. Club. iii, 5 (1893); *Sisymbrium nasturtium* L. Sp. Pl. ii, 657 (1753).

Fall River, near the Chautauqua grounds, above Hot Springs, altitude 1,050 m., June 14 (No. 531).

A form, very low, creeping, extensively rooting, with very fleshy leaves of 0 to 2 small pairs of leaflets and a larger, nearly orbicular, odd leaflet, and with short and thick pods, was growing in the warm springs, at Hot Springs, altitude 1,050 m., June 14 (No. 532).

Lesquerella argentea arenosa (Richards.) Wats. Proc. Amer. Acad. xxiii, 252 (1888); *Vesicaria arenosa* Richards. Bot. App. 743 (1823).

There are no specimens of this variety in the National Herbarium, but I think it is this plant (which is illustrated by specimens in the Harvard Herbarium) that Dr. Watson had in view in his revision. The form of the leaves does not agree fully with the original description in the Appendix to Franklin's Journal, being narrower and with entire margin. The figure of *V. arctica* in Curtis's Botanical Magazine,[1] which, according to Watson, is the same as *V. arenosa* Richards., is drawn from a young specimen, but resembles this much, although it seems to be a little stouter.

My plant is densely stellate-pubescent, much branched from the perennial caudex; radical leaves broadly spatulate or oblanceolate, often a little acutish; stem 1.5 dm.

[1] Bot. Mag., lvi, t. 2882.

high; pod globose or a little elongated, stellate-pubescent with a long style, pedicels recurved as in *L. ludoviciana*, which it resembles, although it is more slender and more branched and has smaller pods.

Hillside, Hot Springs, altitude 1,100 m., June 11 and August 3 (No. 533).

Lesquerella spatulata sp. nov.

Low and somewhat cæspitose; stems 3 to 10 cm. high, subscapose; leaves all radical, spatulate or oblanceolate, decurrent on the petiole; petals spatulate, yellow; pods on recurved pedicels, ovate, only slightly compressed toward the apex, finely pubescent, 4-seeded; septum not perforate; style scarcely as long as the mature pod.

Like the last in habit, but lower. The pod, however, is ovate, pointed, and slightly compressed toward the apex, about the length of the slender style but shorter than the pedicel, which is reflexed and then curved upward. The plant is somewhat intermediate between *L. montana*, the preceding species, and *L. alpina*. From *L. montana* it differs in its more slender habit, narrower leaves, and smaller pods; from *L. alpina*, in being much taller and in having broader leaves, less compressed pods, longer and recurved pedicels, and shorter style. In *L. alpina* the style is longer than the pod, the pedicels erect, and the septum perforated. It differs from *L. argentea arenosa* in the form of the pod. Similar specimens were found in the Harvard Herbarium, viz, in C. C. Parry's collection of 1873 (No. 21) and in the collection of Jenney's expedition, 1875. These were referred to *L. alpina* by Dr. Watson. In the Columbia College herbarium there are the following specimens: H. J. Webber, from Belmont, Nebraska, 1889; Dawson, Milk River, N. W. T., 1883.

Dry hilltop, north of Deadwood, altitude 1,600 m., July 5 (No. 534).

Camelina sativa (L.) Crantz, Stirp. Austr. i, 18 (1762); *Myagrum sativum* L. Sp. Pl. ii, 641 (1753).

Introduced: Railroad embankment above Custer, altitude 1,700 m., July 15 (No. 535).

Bursa bursa-pastoris (L.) Weber in Wigg. Prim. Fl. Holst. 41 (1780); *Thlaspi bursapastoris* L. Sp. Pl. ii, 647 (1753).

The common form was collected in yards at Custer, altitude 1,625 m., June 4 (No. 536).

The so-called variety *integrifolia*, that is, the form with entire leaves, was collected on a hillside near Central City, altitude 1,700 m., July 3 (No. 537).

A delicate form was found with finely pinnatifid leaves; the divisions oblong, sometimes sinuately toothed; pods (immature) broadly oval, sometimes truncate, but not at all triangular. The general appearance reminds one somewhat of *Teesdalia nudicaulis*. Hillside, south of Custer, altitude 1,625 m., May 28 (No. 538).

Lepidium incisum Roth, Neue Beitr. i, 224 (1802).

Rare in the Black Hills: Hot Springs, altitude 1,050 m., June 16 (No. 539).

CAPPARIDACEÆ.

Jacksonia trachysperma (Torr. & Gr.) Greene, Pittonia, ii, 175 (1890); *Polanisia trachysperma* Torr. & Gr. Fl. i, 669 (1840).

Draws among the foothills: Hot Springs, altitude 1,100 m., August 2 (No. 540).

Cleome serrulata Pursh, Fl. ii, 441 (1814).

Draws among the foothills: Hot Springs, altitude 1,100 m., August 2 (No. 541).

CISTACEÆ.

Helianthemum majus (L.) B. S. P. Prel. Cat. N. Y. 6 (1888); *Lechea major* L. Sp. Pl. i, 90 (1753); *Helianthemum canadense walkeræ* Evans, Bot. Gaz. xv, 211 (1890).

The only locality hitherto recorded for this form is the original one in Douglas County, Colorado. Roadside, east of Custer, altitude 1,600 m., July 22 (No. 542).

VIOLACEÆ.

Viola pedatifida Don, Hist. Dichl. Pl. i, 320 (1831).

Valley: Custer, altitude 1,650 m., June 4 (No. 543).

Viola obliqua Hill, Hort. Kew. 316, t. 12 (1769); *Viola palmata obliqua* (Hill) Hitchcock, Trans. St. Louis Acad. v, 487 (1891); *V. cucullata* Ait. Hort. Kew. iii, 288 (1789).

Low grounds: Ruby Gulch, near Custer, altitude 1,650 m., May 31 (No. 544).

Viola palustris L. Sp. Pl. ii, 934 (1753).

Only four specimens in fruit were collected. These have larger and thinner leaves than usual, resembling somewhat those of the Alaskan *V. langsdorfii*. Sylvan Lake, 6 miles northeast of Custer and 4 miles from Harneys Peak, altitude 2,000 m., July 20 (No. 545).

Viola blanda Willd., Hort. Berol. t. 24 (1806).

Among moss, in a canyon below Sylvan Lake, altitude 1,900 m., June 9 (No. 546).

Viola canina adunca (Smith) Gray, Proc. Amer. Acad. viii, 377 (1872); *Viola adunca* Smith, Rees's Cycl. No. 63 (1817).

My specimens lack the dark-brown spots attributed to this variety in Hook. Fl. Bor. Amer. i, 79. Borders of rich woods, early in the spring. South of Custer, altitude 1,650 m., May 30 (No. 547).

Viola canina oxyceras (?) Wats. Bot. Cal. i, 56 (1876).

I have not seen any specimens of this variety, but as it is the only one described with acute spur, I place this plant with it.

Rare: near Lead City, altitude 1,500 m., July 6 (No. 548).

Viola canadensis L. Sp. Pl. ii, 936 (1753).

Common: Little Elk Canyon, altitude 1,100 m., June 29; Elk Canyon, altitude 1,200 m., June 29; Rochford, altitude 1,600 m., July 11 (No. 549).

Viola nuttallii Pursh, Fl. i, 174 (1814).

Prairies and rich valleys: Custer, altitude 1,650 m., June 3; Hot Springs, altitude 1,050 m., June 12 (No. 550).

Viola pubescens Ait. Hort. Kew. iii, 290 (1789).

Rare: Elk Canyon, altitude 1,200 m., June 29 (No. 551).

Viola scabriuscula (Torr. & Gr.) Schwein.; Torr. & Gr. Fl. i, 142 (1838), as synonym; *Viola pubescens scabriuscula* Torr. & Gr. loc. cit.

This plant has nearly always one or more radical leaves at the time of blooming, while *V. pubescens* seldom has any.

Elk Canyon, altitude 1,100 m., June 29 (No. 552).

POLYGALACEÆ.

Polygala senega latifolia Torr. & Gr. Fl. i, 131 (1838).

It is not uncommon in the northern part of the Black Hills. Elk Canyon, altitude 1,300 m., June 30; south of Lead City, altitude 1,600 m., July 6; near Bull Springs in the Limestone District, altitude 1,900 m., July 26 (No. 553).

Polygala alba Nutt. Gen. ii, 87 (1818).

Hills below Hot Springs, altitude 1,000 m., June 17; 15 miles east of Custer, altitude 1,400 m., July 22 (No. 554).

Polygala verticillata L. Sp. Pl. ii, 706 (1753).

Fifteen miles east of Custer, on French Creek, altitude 1,400 m., July 22 (No. 555).

CARYOPHYLLACEÆ.

Saponaria vaccaria L. Sp. Pl. i, 409 (1753).

On the railroad embankment south of Minnekahta, altitude 1,270 m., August 4 (No. 556).

Silene antirrhina L. Sp. Pl. i, 419 (1753).

Very variable. One specimen is about 1 m. high and has broad leaves and minutely pubescent stem; some are only about 1 dm. high and wholly glabrous.

Hermosa, altitude 1,050 m., June 22; Lead City, altitude 1,700 m., July 6; Custer, altitude 1,650 m., August 1 (No. 557).

Lychnis drummondii (Hook.) Wats. Bot. King Surv. 37 (1871); *Silene drummondii* Hook. Fl. Bor. Amer. i, 89 (1830).

It was collected only in fruit. The leaves are unusually narrow and the plant strict. Custer, altitude 1,650 m., August 16 (No. 558).

Cerastium longipedunculatum Muhl. Cat. 46 (1813).

This is very variable. Some are 3.5 to 4.5 dm. high, with large leaves 3 to 5 cm. long and 8 to 12 mm. wide, oblong, oval-lanceolate or spatulate. Rapid City, altitude 1,000 m., June 25; south of Lead City, altitude 1,500 m., July 6; Rochford, altitude 1,600 m., July 11 (No. 559).

The more common form, about 2 to 3 cm. high, with leaves about 25 mm. long and 8 mm. wide, oval or broadly oblong, was collected near Lead City, altitude 1,500 m. July 6; Custer, altitude 1,650 m., June 4 (No. 560).

Cerastium brachypodum (Engelm.) Robinson, Mem. Torr. Club, v, 150 (1894); *Cerastium nutans brachypodum* Engelm.; Gray, Man. ed. 5, 94 (1867).

My specimens are small and approach the variety *compactum*,[1] to which some of them could be referred. Hermosa, on poor soil, altitude 1,050 m., June 22 (No. 561).

Cerastium arvense L. Sp. Pl. i, 438 (1753).

Rarer than the next: Elk Canyon, altitude 1,200 m., June 29; Lead City, altitude 1,700 m., July 6 (No. 562).

Cerastium arvense oblongifolium (Torr.) Britton & Hollick, Bull. Torr. Club, xiv, 47 (1887); *Cerastium oblongifolium* Torr. Fl. U. S. 460 (1824).

Custer, altitude 1,700 m., May 31; Hot Springs, altitude 1,100 m., June 18; Elk Canyon, altitude 1,300 m., June 29 (No. 563).

Alsine longifolia (Muhl.) Britton, Mem. Torr. Club, v, 150 (1894); *Stellaria longifolia* Muhl.; Willd. Enum. 479 (1809).

Grassy places, near water: below Terrys Peak, altitude 1,800 m., July 8; near Sylvan Lake, altitude 2,000 m., July 18 (No. 564).

Arenaria hookeri Nutt.; Torr. & Gray, Fl. i, 178 (1838).

Battle Mountain, east of Hot Springs, altitude 1,150 m., June 18 (No. 565).

Arenaria lateriflora L. Sp. Pl. i, 423 (1753).

Shady woods: Elk Canyon, altitude 1,200 m., June 29; Sylvan Lake, altitude 2,000 m., July 18 (No. 568).

Arenaria stricta Mx. Fl. i, 274 (1803).

Differs from the common form in the length of the petals, which scarcely exceed the acute but not pointed sepals. The leaves are also somewhat broader and more flaccid. Sandy soil: Elk Canyon, altitude 1,200 m., June 29; Little Elk Canyon, altitude 1,100 m., June 28 (No. 566).

Arenaria verna hirta (Wormsk.) Wats. Bot. King Surv. 41 (1871); *Arenaria hirta* Wormsk. Fl. Dan. x, 1646 (1819).

Glandular-puberulent; the upper leaves lanceolate, short, strongly 3-nerved. Shady place among rocks, below Sylvan Lake, altitude 1,900 m., July 18 (No. 567).

Paronychia jamesii Torr. & Gr. Fl. i, 170 (1838).

Dry hills: Hot Springs, altitude 1,100 m., June 13; Hermosa, altitude 1,100 m., June 23 (No. 959).

PORTULACACEÆ.

Talinum parviflorum Nutt.; Torr. & Gr. Fl. i, 197 (1838).

Among rocks, on the south side of Buckhorn Mountain, north of Custer, altitude 1,700 m., July 15 (No. 569).

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[1] Robinson, Proc. Amer. Acad. xxix, 278 (1894).

Claytonia perfoliata amplectens Greene, Fl. Fran. 179 (1891).

It is smaller than the typical *C. perfoliata*, has smaller flowers and shorter pedicels; the involucral leaves united only on one side. It has been collected by Dr. Vasey, in the State of Washington, and by C. V. Piper, near Seattle, same State.

Hills, near Whitewood, altitude 1,200 m., July 7 (No. 570).

HYPERICACEÆ.

Hypericum canadense L. Sp. Pl. ii, 785 (1753).

Low grounds, north of Custer, altitude 1,700 m., August 20 (No. 572).

MALVACEÆ.

Malveopsis coccinea (Nutt.) Kuntze, Rev. Gen. Pl. 72 (1891); *Malva coccinea* Nutt. Fraser's Cat. (1813).

Hillside, above Hot Springs, altitude 1,100 m., June 14 (No. 580).

LINACEÆ.

Linum lewisii Pursh, Fl. i, 210 (1814).

Hillsides: Hot Springs, altitude 1,100 m., June 14; Elk Canyon, altitude 1,200 m., June 29; Rochford, altitude 1,700 m., July 12; Custer, altitude 1,700 m., July 15 (No. 581).

Linum rigidum Pursh, Fl. i, 210 (1814).

Rare: Hot Springs, altitude 1,100 m., June 15 (No. 582).

GERANIACEÆ.

Geranium richardsonii Fisch. & Mey. Ind. Sem. Petrop. iv, 37 (1837).

The most common species in the Black Hills. The flowers are nearly always white or light pinkish with purple veins. Valleys: Elk Canyon, altitude 1,300 m., June 29; Rochford, altitude 1,600 m., July 11; Sylvan Lake, altitude 2,000 m., July 21 (No. 583).

Geranium viscosissimum Fisch. & Mey. Ind. Sem. Petrop. xi, Suppl. 18 (1843); *Geranium incisum* Nutt.: Torr. & Gray, Fl. i, 206 (1838), not Andrews, Bot. Rep. 67 (1814).

Rochford, altitude 1,600 m., July 11; Bull Springs, altitude 1,900 m., July 27 (No. 584).

Geranium carolinianum L. Sp. Pl. ii, 682 (1753).

Elk Canyon, altitude 1,200 m., June 29; Whitewood, altitude 1,100 m., July 7; Custer, altitude 1,650 m., July 15 (No. 585).

Oxalis stricta L. Sp. Pl. i, 435 (1753).

Shady places among the foothills: Rapid Creek, altitude 1,100 m., June 25; Elk Canyon, altitude 1,200 m., June 29 (No. 586).

CELASTRACEÆ.

Celastrus scandens L. Sp. Pl. i, 196 (1753).

Erect, 1 to 1.5 m. high; nowhere found climbing. Rapid City, altitude 1,050 m., June 25; Little Elk Canyon, altitude 1,100 m., June 28; Lead City, altitude 1,600 m., July 6 (No. 587).

RHAMNACEÆ.

Ceanothus velutinus Dougl.; Hook. Fl. Bor. Amer. i, 125 (1830).

Not uncommon in the hills around Lead City, altitude 1,700 m., July 4 (No. 588).

Ceanothus ovatus Desf. Hist. Arb. ii, 381 (1809).

The common peduncles are in most cases elongated, and the leaves are thinner

than in the Nebraska specimens. Little Elk Canyon, altitude 1,100 m., June 28; Elk Canyon, altitude 1,200 m., June 29; south of Lead City, altitude 1,700 m., July 6 (No. 589).

Ceanothus fendleri Gray, Pl. Fendl. 29 (1849).

This is common in the Limestone District, west of Custer. Bull Springs, altitude 2,000 m., July 26 (No. 590).

VITACEÆ.

Vitis vulpina L. Sp. Pl i, 203 (1753).

Hermosa, altitude 1,050 m., June 24; Little Elk, altitude 1,100 m., June 28; Elk Canyon, altitude 1,200 m., June 29 (No. 591).

Parthenocissus quinquefolia (L.) Planch. in DC. Monogr. Phan. v, pt. 2, 488 (1887); *Hedera quinquefolia* L. Sp. Pl. i, 202 (1753).

Elk Canyon, altitude 1,200 m., June 29 (No. 592).

ACERACEÆ.

Acer negundo L. Sp. Pl. ii, 1056 (1753).

In fruit: Hot Springs, altitude 1,050 m., June 18 (No. 593).

ANACARDIACEÆ.

Rhus radicans toxicodendron (L.) Pers. Syn. Pl. i, 325 (1805); *Rhus toxicodendron* L. Sp. Pl. i, 266 (1753).

For remarks on this form of the poison ivy, see page 152 of this volume.

In the foothills: Hermosa, altitude 1,100 m., June 28 (No. 594).

Rhus trilobata Nutt.; Torr. & Gr., Fl. i, 219 (1838).

I found stems of this shrub 2.5 to 3 m. high and 7 to 8 cm. in diameter, and with leaflets 3 to 4 cm. long. Hot Springs, altitude 1,100 m., June 11 and August 8 (No. 595).

PAPILIONACEÆ.

Thermopsis rhombifolia (Pursh) Richards. Bot. App. 737 (1823); *Cytisus rhombifolia* Pursh, Fl. Suppl. 741 (1814).

Common: Custer, altitude 1,700 m., June 23 (No. 596).

Lupinus sericeus Pursh, Fl. ii, 468 (1814), var.

This is *L. ornatus* Dougl., var., of Newton & Jenney's Report.[1]

The Black Hills and Wyoming specimens have the flowers dark blue and the calyx little gibbous. I think, however, they belong to this species rather than to *L. leucophyllus*, with which in some cases they have been placed. Elk Canyon, altitude 1,200 m., June 29; near Bull Springs in the Limestone District, altitude 1,900 m., July 27 (No. 597).

Lupinus parviflorus Nutt.; Hook & Arn. Bot. Beech. 336 (1840).

Common: Little Elk Canyon, altitude 1,100 m., June 28; Elk Canyon, altitude 1,200 m., June 29; Lead City, altitude 1,700 m., July 4; Bull Springs, altitude 1,900 m., July 28 (No. 598).

Lupinus pusillus Pursh, Fl. ii, 468 (1814).

Hill near Fall River Falls, altitude 1,000 m., June 17 (No. 599).

Trifolium pratense L. Sp. Pl. ii, 768 (1753).

Escaped in meadows: Buffalo Gap, altitude 975 m., June 21; Hot Springs, altitude 1,050 m., August 2 (No. 600).

Trifolium repens L. Sp. Pl. ii, 767 (1753).

Meadows: Custer, altitude 1,650 m., August 1 (No. 601).

Lotus americanus (Nutt.) Bisch. Litt. Ber. Linnæa, xiv, 132 (1840); *Trigonella americana* Nutt. Gen. ii, 120 (1818).

Hills, near Whitewood, altitude 1,150 m., July 7 (No. 602).

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[1] Geol. Surv. Black Hills, 532 (1880).

Psoralea tenuiflora Pursh, Fl. ii, 475 (1814).

In the foothills, 15 miles east of Custer, altitude 1,400 m., July 23 (No. 603).

Psoralea argophylla Pursh, Fl. ii, 475 (1814).

Rochford, altitude 1,600 m., July 12; Custer, altitude 1,650 m., July 15; Hot Springs, altitude 1,100 m., August 8 (No. 604).

Psoralea cuspidata Pursh, Fl. ii, 741 (1814).

Among the foothills: Fall River Falls, altitude 1,050 m., August 10 (No. 605).

Psoralea esculenta Pursh, Fl. ii, 475 (1814).

The specimens from Lead City are low, 7 to 10 cm. high, with obovate leaflets and whitish flowers. Hot Springs, altitude 1,100 m., June 18; Hermosa, altitude 1,050 m., June 23; Lead City, altitude 1,700 m., July 4; Rochford, altitude 1,700 m., July 12 (No. 606).

Parosela enneandra (Nutt.) Britton, Mem. Torr. Club, v, 196 (1894); *Dalea enneandra* Nutt. Fraser's Cat. 1813.

Among the foothills: Hot Springs, altitude 1,100 m., August 2 (No. 607).

Parosela aurea (Pursh) Britton, Mem. Torr. Club, v, 196 (1894); *Dalea aurea* Nutt.; Pursh, Fl. ii, 740 (1814).

Among the foothills: Hot Springs, altitude 1,150 m., August 2 (No. 608).

Amorpha canescens Pursh, Fl. ii, 467 (1814).

Hills, 15 miles east of Custer, altitude 1,400 m., July 22; Hot Springs, altitude 1,100 m., August 2 (No. 609).

Amorpha fruticosa L. Sp. Pl. ii, 713 (1753).

This was seen growing along French Creek and Fall River, but no specimens were secured.

Kuhnistera purpurea (Vent.) MacMillan, Metasp. Minn. Val. 329 (1892); *Dalea purpurea* Vent. Hort. Cels. t. 40 (1800).

Variable. Some of the specimens are pubescent on the stem, but most of them are glabrous and have short spikes with the calyx woolly, rather than silky. In the Limestone District, altitude 1,900 m., July 27; Hot Springs, altitude 1,100 m., August 2 (No. 610). Some of the specimens from the latter place have white flowers (No. 611).

Kuhnistera candida occidentalis Rydberg, Contr. Nat. Herb. iii, 154 (1895).

In the specimens of this collection the bracts are shorter than the calyx, in which respect they approach the variety *multiflora*.

Hot Springs, altitude 1,100 m., August 2 (No. 612).

Astragalus crassicarpus Nutt. Fraser's Cat. 1813.

Nearly all my specimens from the Black Hills have large (16 to 20 mm. long), ochroleucous flowers, purplish only at the tip; but without doubt they all belong to *A. crassicarpus*. Custer, altitude 1,650 m., May 31 to June 4 (No. 613).

Astragalus sp.

The specimens are without pods, hence can not well be determined. The plant may be a form of the preceding, which it resembles, though more upright, ascending; racemes elongated (1.5 dm. long), flowers distant on upright pedicels, bracts about 4 mm. long, calyx appressed-hairy with dark hairs; corolla dark purple. Only one plant found, that in full bloom on Battle Mountain, east of the Hot Springs, altitude 1,200 m., June 18 (No. 614).

Astragalus plattensis Nutt.; Torr. & Gr. Fl. i, 332 (1838).

Not uncommon in the southern part of the Black Hills. Hot Springs, altitude 1,100 m., June 13, August 3 (No. 615).

Astragalus carolinianus L. Sp. Pl. ii, 757 (1853).

Rochford, altitude 1,700 m., July 12; French Creek, 15 miles below Custer, altitude 1,500 m., July 23 (No. 616).

Astragalus adsurgens Pall. Astrag. 10, t. 31 (1800); *Astragalus laxmanni* Pall. (?), Nutt. & authors, not Jacq. Lately the name *A. laxmanni* Jacq.,[1] has been adopted for our American plant. Although there is nothing in the original description that really disagrees with our plant, yet the plate accompanying it shows that Jacquin's *A. laxmanni* was of a different habit. The stem is very slender and decumbent, the leaflets narrower and smaller, the heads, or rather spikes, much longer and narrower. The pods seem to be like those of *A. adsurgens*, but are more truncate at the apex and have the style abruptly turned dorsally, making a right angle with the pod.[2] In *A. adsurgens* the pod acuminates into a nearly central style, which is somewhat twisted and curved dorsally, but does not make a right angle. In the Columbia College Herbarium there is a specimen of *A. laxmanni* collected by A. Regel in Turkestan, which perfectly agrees with the figure in Hortus Vindobonensis. The flowers of this, although of about the length of those of *A. adsurgens*, are much narrower, the calyx less than one-half the length of the claws of the petals, or with the teeth about two-thirds their length, while in *A. adsurgens* the calyx with the teeth nearly equals the claws.

Common in the region Some specimens from Hot Springs have a more decumbent stem and brighter blue flowers. Hot Springs, altitude 1,100 m., June 8; Hermosa, altitude 1,050 m., June 22; Custer, altitude 1,700 m., July 15 (No. 617).

Astragalus hypoglottis L. Mant. ii, 271 (1771).

Not uncommon among the foothills: Hot Springs, altitude 1,100 m., June 14; Hermosa, altitude 1,050 m., June 22 (No. 618).

Astragalus drummondii Dougl.; Hook. Fl. Bor. Amer. i, 153 (1834).

Hills near Hot Springs, altitude 1,100 m., June 18 (No. 619).

Astragalus racemosus Pursh, Fl. ii, 740 (1814).

The corolla is ochroleucous rather than white, and the angles of the pods are blunter than in Nebraska specimens collected in 1891. Near Fall River Falls, altitude 1,000 m., June 17 (No. 620).

Astragalus gracilis Nutt. Gen. ii, 100 (1818).

Hot Springs, altitude 1,100 m., June 15 (No. 573).

Astragalus microlobus Gray, Proc. Amer. Acad. vi, 203 (1864).

Hot Springs, altitude 1,100 m., June 15 (No. 621).

Astragalus aboriginum Richards. Bot. App. 746 (1823).

The fruit is membranaceous, long-stipitate, strictly 1-celled, but the dorsal suture a little inflexed, straight, the ventral one curved. It was collected in fruit only, north of Deadwood, altitude 1,500 m., July 5 (No. 622).

Astragalus aboriginum glabriusculus (Hook.); *Phaca glabriuscula* Hook. Fl. Bor. Amer. i, 144 (1830).

This has generally been regarded as a distinct species, but even Hooker says, in the original description, that it may be a variety of the preceding. The only difference I can find is that the plant is smoother and the pod a little more curved. The flowers are ochroleucous, the keel tipped with purple. Custer, altitude 1,700 m., June 1; Rochford, altitude 1,700 m., July 12; Limestone District, altitude 2,000 m., July 26 (No. 623).

Astragalus alpinus L. Sp. Pl. ii, 760 (1753).

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[1] Hort. Vind. iii, 22 (1776).

[2] There is a species from Japan, much larger but with the same pod characters, in the National Herbarium. This was identified by Bunge, the well-known authority on Old World Astragali, as *A. adsurgens*, but is evidently distinct. It differs in the style, and in its more slender, less distinctly striate stem, its looser heads on peduncles which are neither strict nor longer than the leaves. Notwithstanding Bunge's determination the plant can not be *A. adsurgens*, this name belonging to our species, as is plainly shown by the original plates.

In woods: Custer, altitude 1,700 m., June 3; Little Elk Canyon, altitude 1,200 m., June 28; Lead City, altitude 1,600 m., July 6; Rochford, altitude 1,700 m., July 11 (No. 624).

Astragalus lotiflorus Hook. Fl. Bor. Amer. i, 152 (1834).

In nearly all the specimens of my collection the flowers are in short, capitate racemes, but at least in some a part of the flowers are sessile, the plant thus approaching the forma *brachypus* Gray. Mr. E. P. Sheldon has raised the latter to specific rank, but it can scarcely be regarded even as a variety, and Dr. Gray seems to me to have disposed of it correctly.

Hot Springs, altitude 1,100 m., June 16 (No. 625).

Astragalus missouriensis Nutt. Gen. ii, 99 (1818).

The specimens from the Black Hills are, like those from Nebraska, greener than the species generally is farther south. Hot Springs, altitude 1,100 m., June 13 (No. 626).

A few specimens collected at Hermosa, altitude 1,000 m., June 23, differ considerably from the common form. The stem is not cespitose, but ascending, less hairy; leaflets larger, obovate; flowers racemose or subcapitate on a long peduncle. In general appearance, color of the flowers, etc., they resemble *A. adsurgens*, but the heads are more lax, the leaflets broader, and the plant more hairy. The pubescence, although sparser, is that of *A. missouriensis*, so also the pod. It may be a hybrid between the two, which were found growing together (No. 627).

Astragalus frigidus americanus (Hook.) Wats. Ind. 193 (1878); *Phaca frigida americana* Hook. Fl. Bor. Amer. i, 140 (1830).

The flowers in my specimens are light ochroleucous. Low ground in shade: Rochford, altitude 1,600 m., July 12 (No. 628).

Astragalus bisulcatus (Hook.) Gray, Pac. R. Rep. xii, bk. ii, pt. ii, 42 (1860); *Phaca bisulcata* Hook. Fl. Bor. Amer. i, 145 (1834).

Plains among the foothills: Hermosa, altitude 1,000 m., June 23 (No. 629).

Astragalus flexuosus Dougl.; Hook. Fl. Bor. Amer. i, 141 (1834), as synonym; *Phaca flexuosa* Hook. loc. cit.

The specimens are large and decumbent. Rochford, altitude 1,700 m., July 12 (No. 630).

Astragalus convallarius Greene, Erythea, i, 207 (1893).

Only a few slender specimens were collected. The flowers are unusually small, ochroleucous. Bull Springs, altitude 2,000 m., July 29 (No. 631).

Astragalus tenellus Pursh, Fl. ii, 473 (1814).

Near Bull Springs, altitude 1,900 m., July 27 (No. 632).

Astragalus spatulatus Sheld. Geol. & Nat. Hist. Surv. Minn. Bull. 9, pt. i, 22 (1894).

Probably *A. simplicifolius* Gray, of Newton & Jenney's Report.[1]

Hot Springs, altitude 1,100 m., June 13; Bull Springs, altitude 1,900 m., July 27 (No. 633). Near the latter place some specimens were found with 3 and 2-foliate leaves, showing that the common form has developed by reduction. July 28 (No. 634).

Astragalus gilviflorus Sheldon. Geol. & Nat. Hist. Surv. Minn. Bull. 9, pt. i, 21 (1894).

Foothills: Hot Springs, altitude 1,100 m., June 18 (No. 635).

Spiesia viscida (Nutt.) Kuntze, Rev. Gen. Pl. i, 207 (1891); *Oxytropis viscida* Nutt.; Torr. & Gr. Fl. i, 341 (1838); *Oxytropis monticola* Gray, Proc. Amer. Acad. xv, 6 (1885).

My specimens differ from all except one of those named *O. viscida* in the National Herbarium in being more silky and having larger, yellowish flowers in an elongated spike. The one excepted was collected by Wm. C. Cusick in Oregon, which is nearer to the type locality of Nuttall's plant than any of the localities represented by the other specimens. Nuttall's type locality was, "near the sources of the Oregon"

[1] Geol. Surv. Black Hills, 533 (1880).

(Columbia). In the Gray Herbarium there is a poor specimen of the original *O. viscida* of Nuttall, and this resembles more my plant, which Dr. Gray would have included in *O. monticola* (Jenney's plants from the Black Hills are included in the latter), rather than in *O. viscida* as understood by him.

Common around Custer, altitude 1,650 to 1,700 m., June 5 (No. 636).

Spiesia lambertii (Pursh) Kuntze, Rev. Gen. Pl. i, 207 (1891); *Oxytropis lambertii* Pursh, Fl. ii, 740 (1814).

Hot Springs, altitude 1,100 m., June 18; Rochford, altitude 1,700 m., July 11 (No. 638).

Spiesia lambertii sericea (Nutt.) Rydberg. Bot. Surv. Nebr. iii, 32 (1894); *Oxytropis sericea* Nutt.; Torr. & Gr. Fl. i, 339 (1838).

All my specimens have yellow flowers. In a few the calyx is somewhat viscid, and these can scarcely be distinguished from the preceding species except by the size. The bracts are narrower than in the blue-flowered forms I have seen.

Hot Springs, altitude 1,100 m., June 16 (No. 637).

Glycyrrhiza lepidota Pursh, Fl. ii, 480 (1814).

On the French Creek, 15 miles below Custer, altitude 1,400, July 22 (No. 639).

Hedysarum americanum Britton, Mem. Torr. Club. v, 201 (1894); *Hedysarum alpinum americanum* Mx. Fl. ii, 74 (1803); *H. boreale* Nutt. Gen. ii, 110 (1818).

In Coulter's Manual the stamens are given as diadelphous (5 and 1), in Gray's Manual as diadelphous (9 and 1) in the key, but as 5 and 1 in the description of the genus. In all flowers investigated, they were 9 and 1, but the united stamens were of two different lengths, every second one being shorter.

Hills: Rochford, altitude 1,700 m., July 12 (No. 640).

Vicia americana Muhl.; Willd. Sp. Pl. iii, 1096 (1801).

Common: Little Elk Canyon, altitude 1,100 m., June 28; Elk Canyon, altitude 1,200 m., June 29; Lead City, altitude 1,600 m., July 6 (No. 641).

Vicia americana linearis (Nutt.) Wats. Proc. Amer. Acad. xi, 134 (1876); *Lathyrus linearis* Nutt.; Torr. & Gr. Fl. i, 276 (1838).

V. americana and this plant grow together sparsely everywhere in Nebraska. I have not seen any intermediate forms, but they both grade into the variety *truncata*.

Hot Springs, altitude 1,050 m., June 16 (No. 643).

Vicia americana truncata (Nutt.) Brewer, Bot. Cal. i, 158 (1856); *Vicia truncata* Nutt.; Torr. & Gr. Fl. i, 270 (1838).

Always near water, where *V. americana* and *V. linearis* are found on the drier land.

Hot Springs, altitude 1,050 m., June 13 (No. 642).

Lathyrus ochroleucus Hook. Fl. Bor. Amer. i., 159 (1833).

Common and very luxurious in the Black Hills. It is regarded as a very good fodder plant, and may be of economic value.

Rapid Creek, altitude 1,000 m., June 25; Elk Canyon, altitude 1,200 m., June 29 (No. 644).

ROSACEÆ.

Prunus americana Marsh. Arb. Amer. 111 (1785).

Draws among the foothills: Minnekahta, altitude 1,275 m., August 4 (No. 645).

Prunus besseyi Bailey, Bull. Cornell Agr. Exp. Sta. 70, 261 (1894).

In the foothills: Hermosa, altitude 1,050 m., June 23; Minnekahta, altitude 1,300 m., August 4 (No. 646).

Prunus pennsylvanica L. f. Suppl. 252 (1781).

In the Black Hills it never becomes a large tree. The largest specimens I saw were less than 7 m. high. On the hills around Lead City, it is only a small shrub, not much taller than the preceding, and has generally folded leaves.

Woods: Custer, altitude 1,700 to 1,800 m.; Lead City, altitude 1,700 m., July 3 and 6 (No. 647).

Prunus virginiana L. Sp. Pl. i, 473 (1753).

Wholly glabrous; leaves dull, ovate with acuminate base, thin, sharply serrate. In the Black Hills only a shrub or a low tree, at most 6 cm. in diameter. In damp, shaded canyons: Hot Springs, altitude 1,100 m., June 13; Sylvan Lake, altitude 2,000 m., July 18 (No. 648).

Prunus demissa (Nutt.) Walp. Rep. ii, 10 (1843); *Cerasus demissa* Nutt.; Torr. & Gr. Fl. i, 411 (1840).

I include under this two forms. One is the common chokecherry of the western plains. It is generally glabrous; leaves oval with truncate or even cuneate base, thick, pale beneath. It differs from *P. virginiana* in the much thicker leaves and sweeter fruit. Wherever I have seen it, it is a small tree—that is, it has one principal stem, with a rounded top. It has been named *P. demissa*, although I doubt whether it is identical with the original. Rochford, altitude 1,600 m., July 12 (No. 649).

The other form has the young shoots, peduncles, and lower surface of the leaves pubescent, and even a little viscid, glabrate in age; leaves thick, shining above, paler beneath, elliptical or broadly oval, abruptly pointed or obtuse; base truncate or slightly cordate, or sometimes somewhat cuneate; flowers larger than in the preceding two. A low shrub, generally a few meters high. The largest stem I saw was about 5 cm. in diameter, with heartwood fully as dark as in *P. serotina*. It was growing in the same canyon as *P. virginiana*, from which it was easily distinguished. Hot Springs, altitude 1,100 m., June 13 and August 8 (No. 650).

Spiræa lucida Dougl.; Hook. Fl. Bor. Amer. i, 172 (1833), as synonym; *S. betulifolia* Hook. loc. cit., not Pall.

Professor Greene[1] has separated the American species from the Asiatic.

Rapid City, altitude 1,000 m., June 25; Little Elk, altitude 1,100 m., June 28; Lead City, altitude 1,600 m., July 6 (No. 651).

Luetkea cæspitosa (Nutt.) Kuntze, Rev. Gen. Pl. i, 217 (1891); *Spiræa cæspitosa* Nutt.; Torr. & Gr. Fl. i, 418 (1840).

Neither flowers nor fruit were found. The plant was growing on the hills around Little Elk, altitude 1,300 m., June 28 (No. 652).

Opulaster opulifolius (L.) Kuntze, Rev. Gen. Pl. ii, 949 (1891), var.; *Spiræa opulifolia* L. Sp. Pl. i, 489 (1753).

My specimens from northern Nebraska and those I have seen from Colorado differ from the *Opulaster opulifolius* of the eastern United States in having pubescent ovaries. The pubescence remains, partly at least, until maturity, while in the eastern form the fruits are smooth and shining. The ovaries are generally only three, and the leaves smaller and more rounded in outline. This form seems to connect this species and the following. Seeds obliquely pear-shaped, shining, carinate on one side.

In the lower parts of the Hills near water. Rapid Creek, altitude 1,100 m., June 25; French Creek, 10 miles below Custer, altitude 1,500 m., June 22; Hot Springs, altitude 1,050 m., August 2 (No. 653).

Opulaster monogyna[2] (Torr.) Kuntze, Rev. Gen. Pl. ii, 949 (1891); *Spiræa monogyna* Torr. Ann. Lyc. N. Y. ii, 1892 (1827).

Very shrubby, 3 to 6 dm. high; leaves small, about 2.5 cm. long, round in outline, deeply 3 to 5 cleft, teeth sharper than in the preceding; flowers half the size, ovaries mostly 2, very woolly. The leaves are perfectly smooth, in this point disagreeing with the description of *Neillia torreyi*, but otherwise agreeing with the

[1] Pittonia, ii, 221.

[2] Thus named by Professor Greene. I have seen specimens of an Opulaster, collected by Dr. Sandberg in Idaho, which fits the description of *Spiræa monogyna* Torr., loc. cit., even as to the number of the carpels. This differs as much from my specimens as does *Opulaster opulifolia*.

type specimens. It also disagrees in several points with the description of Professor Greene, especially in the size of the flowers. Perhaps all the Opulasters of North America are but one very variable species.

Hills near Harneys Peak, altitude 2,100 m., July 21, August 17 (No. 654).

Rubus parviflorus Nutt. Gen. i, 308 (1818).

Not uncommon: Elk Canyon, altitude 1,300 m., June 29; Lead City, altitude 1,600 m., July 4 (No. 655).

Rubus americanus (Pers.) Britton, Mem. Torr. Club, v, 185 (1894); *Rubus saxatilis americanus* Pers. Syn. ii, 52 (1807).

Canyon north of Runkels, altitude 1,300 m., June 30; Lead City, altitude 1,600 m., July 4 (No. 656).

Rubus strigosus Mx. Fl. i, 297 (1803).

Little Elk Canyon, altitude 1,200 m., June 28; Elk Canyon, altitude 1,300 m., June 29; Rochford, altitude 1,700 m., July 12 (No. 657).

Cercocarpus parvifolius Nutt.; Hook. & Arn. Bot. Beech. Suppl. 337 (1841).

Very rare: Hot Springs, altitude 1,100 m., June 13 (No. 658).

Geum strictum Ait. Hort. Kew. ii, 217 (1789).

Lead City, altitude 1,600 m., July 6 (No. 659).

Geum macrophyllum Willd. Enum. i, 557 (1809).

I think this would better be regarded as a variety of the preceding. Rapid City, altitude 1,050 m., June 25; Rochford, altitude 1,600 m., July 11 (No. 1206).

Geum ciliatum Pursh, Fl. i, 352 (1814).

This name precedes *G. triflorum* in Pursh's Flora.[1] Common: Custer, altitude 1,700 m., May 28; Elk Canyon, altitude 1,200 m., June 29; Lead City, altitude 1,600 m., July 4 (No. 660.)

Fragaria virginiana Duchesne, Hist. Nat. Frais. 204 (1766).

A low, small-leafed form, collected early in the spring. Custer, altitude 1,650 m., June 4 (No. 661).

Fragaria vesca americana Porter, Bull. Torr. Club, xvii, 15 (1890).

Custer, altitude 1,700 m., June 6; Hot Springs, altitude 1,100 m., June 14; Rapid City, altitude 1,000 m., June 25; in fruit, Custer, August 20 (No. 662).

A slender form with very thin, cuneate, narrow leaves, 3 times as long as broad, toothed towards the apex, the peduncles slender, about the length of the leaves, was collected near Sylvan Lake, altitude 1,900 m., July 18 (No. 663).

Potentilla arguta Pursh, Fl. ii, 736 (1814).

The flowers appear to be always white, but they turn yellow in drying. Hills: Hermosa, altitude 1,100 m., June 22; Lead City, altitude 1,700 m., July 6 (No. 664).

Potentilla glandulosa Lindl. Bot. Reg. xix, t. 1583 (1833).

In this the flowers are light yellow, the cyme more diffuse than usual. Hills: Rochford, altitude 1,700 m., July 12 (No. 665).

Potentilla monspeliensis L. Sp. Pl. i, 499 (1753).

This includes *P. norvegica* L. described lower on the same page. Hot Springs, altitude 1,050 m., June 14; Hermosa, June 22; Rapid City, altitude 1,000 m., June 25; Elk Canyon, altitude 1,200 m., June 29; Rochford, altitude 1,600 m., July 11. The specimens from the latter place are very slender and approach *P. rivalis* (No. 666).

Potentilla pennsylvanica strigosa Pursh, Fl. i, 356 (1814).

Common: Hermosa, altitude 1,050 m., June 23; Rochford, altitude 1,700 m., July 11; Custer, altitude 1,625 m., August 13 (No. 667).

Potentilla hippiana Lehm. Nov. Stirp. Pug. ii, 7 (1830).

Rochford, altitude 1,600 m., July 12; Custer, altitude 1,650 m., July 18 (No. 668). These specimens seem to be typical, agreeing fully with the description and plate in

[1] Pursh, Fl. ii, 736.

Hooker's Flora, except that the branches of the cyme are more upright and the calyx lobes longer. A slender form approaching *P. effusa* was collected at Bull Springs, July 26 (No. 669).

Potentilla hippiana diffusa (Gray) Lehm. Add. Ind. Hort. Hamb. 8 (1849); *P. diffusa* Gray, Pl. Fendl. 41 (1849).

Custer, 1,650 m., August 13 (No. 669½).

Potentilla gracilis Dougl.; Hook. Bot. Mag. lvii, t. 2984 (1830).

This plant has always been regarded as *P. gracilis* Dougl., but there is a specimen so labeled, collected by Mr. Douglas at Puget Sound, in the Columbia College herbarium, and it seems quite different.

Lead City, altitude 1,700 m., July 4; Rochford, altitude 1,600 m., July 12 (No. 670).

Potentilla gracilis fastigiata (Nutt.) Wats. Proc. Amer. Acad. viii, 557 (1873); *P. fastigiata* Nutt.; Torr. & Gr. Fl. i, 440 (1838).

Rochford, altitude 1,550 m., July 11 (No. 671).

Potentilla nivea dissecta Wats. Proc. Amer. Acad. viii, 559 (1873).

This form was included in Dr. Watson's variety, but it seems to have very little relationship to *P. nivea*. It appears to be connected rather with *P. concinna humistrata* and forms of *P. gracilis*. The name should also be changed, as there is an older *P. dissecta* Pursh. It will be left, however, in the present form until its relationship is settled.

Rare: Hot Springs, altitude 1,100 m., June 11 (No. 672).

Potentilla concinna Richards. App. Frankl. Journ. ed. 2, 20 (1823).

Custer, altitude 1,650 m., June 3 (No. 673).

Potentilla concinna humistrata, nom. nov.; *P. concinna humifusa* (Nutt.) Lehm. Rev. Pot. 112 (1856); *P. humifusa* Nutt. Gen. i, 310 (1818), not Willd.; Schlecht. Gesell. Naturf. Freunde Berlin Mag. vii, 289 (1813).

Hills north of Deadwood, altitude 1,500 m., July 5 (No. 673½).

Potentilla fruticosa L. Sp. Pl. i, 495 (1753).

Dry hills and mountain sides: Elk Canyon, altitude 1,300 m., June 29; Rochford, altitude 1,700 m., July 12 (No. 674).

Agrimonia striata Mx. Fl. i, 287 (1803).

Custer, altitude 1,650 m., July 18; Rochford, altitude 1,600 m., July 12 (No. 675).

Rosa engelmanni Wats. Gard. & For. ii, 376 (1889).

Common in the Black Hills: Little Elk Canyon, altitude 1,100 m., June 28; Lead City, July 4; Rochford, July 12; Custer, altitude 1,700 m., August 19 (No. 676).

Rosa woodsii Lindl. Ros. Monogr. 21 (1820).

The sepals are, however, seldom lobed. A character so unstable, should never be used to distinguish the roses.[1] Hot Springs, altitude 1,050 m., July 17; Hermosa, altitude 1,000 m., June 24; Little Elk Canyon, altitude 1,100 m., June 27 (No. 677).

Rosa arkansana Porter, Port. & Coult. Fl. Col. 38 (1874).

I thought at first that this must be a form of *R. humilis*, as the sepals are deciduous, but the leaflets are different; there are no infrastipular spines, and the calyx is not setose. It agrees best with *R. arkansana*, except as to the deciduous sepals. A very low shrub, only 1 to 2 dm. high, growing on a very dry hill near Hermosa, altitude 1,100 m., June 23 (No. 678).

Cratægus macrantha Lodd.; Loud. Arb. & Frut. ed. 2, ii, 819 (1854).

Among the foothills: Hermosa, altitude 1,100 m., June 23; canyon north of Runkels, altitude 1,300 m., June 30 (No. 679).

Amelanchier alnifolia Nutt.; Torr. & Gr. Fl. i, 473 (1840), as synonym; *Aronia alnifolia* Nutt. Gen. i, 306 (1818).

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[1] The character is not given in the original description (Lindley, on the contrary, states that the sepals are entire) and seems to have been added by Dr. Watson.

Leaves densely white-woolly beneath when young, but wholly glabrous when mature. The leaves of my specimens are unusually thin. Custer, altitude 1,700 m., June 5 and July 15; Hermosa, altitude 1,100 m., June 24; Elk Canyon, altitude 1,300 m., June 29 (No. 680).

Sorbus sambucifolia (Cham. & Schlecht.) Roem. Syn. Mon. iii, 39 (1847); Cham. & Schlecht. Linnæa, ii, 36 (1827).

According to Mr. Runkel, an enterprising lumberman, this is growing in a canyon on the road between Runkel's sawmills and Sturgis. I did not see any specimens in the Black Hills.

SAXIFRAGACEÆ.

Saxifraga cernua L. Sp. Pl. i. 403 (1753).

A few slender specimens in bud, collected above Sylvan Lake, altitude 2,000 m., July 8 (No. 681).

Tellima parviflora Hook. Fl. Bor. Amer. i, 239 (1833).

Rare: Custer, altitude 1,700 m., June 4; west of Lead City, altitude 1,800 m., July 4 (No. 682).

Heuchera hispida Pursh, Fl. i, 188 (1814).

Common: Hot Springs, altitude 1,100 m., June 8; Rochford, altitude 1,700 m., July 12 (No. 683).

Heuchera parvifolia Nutt.; Torr. & Gr. Fl. i, 581 (1840).

Only one specimen secured at Rochford, altitude 1,700 m., July 12 (No. 684).

Parnassia parviflora DC. Prodr. i, 320 (1824).

French Creek, below Custer, altitude 1,600 m., August 1 (No. 685).

Ribes setosum Lindl. Trans. Hort. Soc. vii, 243 (1830).

This agrees with the description, also by Lindley, in the Botanical Register,[1] except that the berries are rarely bristly. Dr. Gray says, in the American Naturalist:[2] "The young berries, either perfectly smooth and naked, or beset with a few bristly prickles." It has been taken for *R. oxycanthoides* L. (*R. hirtellum* Mx.), from which it differs in that the leaves are finely pubescent, the calyx cylindrical and longer than the lobes. The bush is generally more spiny and prickly, and the berry sometimes a little bristly, dark purple, and extremely sour even when ripe. It has been found in northwestern Nebraska by Professor Swezey, of the University of Nebraska, who was the first to recognize it as *R. setosum* Lindl.

Most specimens in herbaria under the name *R. setosum* are not *R. setosum* of Lindley, but of Gray,[3] which is a variety of *R. lacustre* Poir. or a related species. It resembles *R. setosum* Lindl. somewhat in general habit, but the flowers and fruit are different.

Very common in the Black Hills: Custer, altitude 1,700 to 1,900 m., May 29; in fruit, Minnekahta, altitude 1,300 m., August 5 (No. 686).

Ribes oxycanthoides L. Sp. Pl. i, 201 (1753), var.

I place this plant doubtfully with this species, from which it differs in the longer peduncles and the longer calyx tube. It may also be a form of the preceding, but is nearly without thorns. The leaves are more deeply cleft, with acutish lobes, smooth and shining above, finely and sparingly pubescent beneath, in form resembling somewhat those of *R. aureum*. The flowers are as in *R. setosum*, i. e., the calyx cylindrical, a little longer than the narrowly oblong calyx lobes; spines and bristles very rare and small; petioles ciliated by a few fine-fringed bristles. Immature fruit smooth, yellowish; mature fruit not seen. The stem and leaves of *R. aureum*, with the pubescence and flowers of *R. setosum*, would fairly represent my plant, which may, perhaps, be a hybrid between the two.

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[1] xv, t. 1237 (1829).

[2] x, 271 (1876).

[3] Proc. Amer. Acad. viii, 383 (1872).

Only two small bushes seen in a shady place below Sylvan Lake, altitude 1,900 m., July 18 (No. 687).

Ribes lacustre (Pers.) Poir. Encycl. Suppl. ii, 856 (1811); *Ribes oxycanthoides lacustre* Pers. Syn. i, 252 (1805).

In shady, damp places; not common: South of Lead City, altitude 1,500 m., July 6; Sylvan Lake, altitude 1,900 m., August 17, (No. 688).

Ribes cereum Dougl. Trans. Hort. Soc. Lond. vii, 512 (1830).

In Coulter's Manual and in the Botany of California this species has been placed in the wrong section, as the calyx is tubular and the foliage glandular. In the Botany of California the form of the calyx is given in the description of the species, but in Coulter's Manual this is ommitted. Specimens collected in flower, therefore, have been named *R. sanguineum variegatum*.

Common: Custer, altitude 1,700 to 1,800, June 11; 15 miles east of the same place, altitude 1,400 m., July 23 (No. 689).

Ribes aureum Pursh, Fl. i, 164 (1814).

In the foothills: Hot Springs, altitude 1,100 m., June 11 and August 3; Fall River Falls, altitude 1,000 m., June 17 (No. 690).

CRASSULACEÆ.

Sedum stenopetalum Pursh, Fl. i, 324 (1814).

It is nearly always more or less branched from the root. On rocky hills: Piedmont, altitude 1,100 m., June 27; Lead City, altitude 1,700 m., July 6; Buckhorn Mountain, near Custer, altitude 1,800 m., July 18 (No. 691).

HALORAGIDACEÆ.

Callitriche palustris L. Sp. Pl. ii, 969 (1753).

I mistook this for *Elatine americana*, which the plant very much resembles. Common in springs and brooks; spring, near Buckhorn Mountain, altitude 1,700 m., July 15; brook, 6 miles northwest of Custer, July 25 (No. 571).

ONAGRACEÆ.

Epilobium angustifolium L. Sp. Pl. i, 347 (1753).

Woody hills: Rochford, altitude 1,700 m., July 11; Sips Spring, in the Limestone District, altitude 1,800 m., July 28 (No. 692).

Epilobium lineare Muhl. Cat. 39 (1813).

The leaves are often opposite and are acutish, short-petioled, and without veins. In a marsh near Pringle, altitude 1,500 m., August 6 (No. 693).

Epilobium palustre L. Sp. Pl. i, 348 (1750).

This was named thus doubtfully by Dr. William Trelease. In his letter respecting the specimens submitted he adds: "However, they are pretty clearly that species, or possibly a hybrid of *lineare*, with the leaves broadened by hybridity." The latter seems to be the case. They are, very likely, hybrids of the preceding and *E. adenocaulon*, together with which two they were growing. After a careful search in the marsh, I could not find more than four specimens, nor did I see it elsewhere in the Hills. Pringle, altitude 1,500 m., August 6 (No. 694).

Epilobium adenocaulon Haussk. Oest. Bot. Zeitsch. 119 (1879).

Two forms were collected. One is branched, with smaller, more dentate leaves, approaching *E. coloratum* in general habit. Pringle, altitude 1,500 m., August 6 (No. 695).

The other is simple, with larger oblong-ovate leaves. Rochford, altitude 1,600 m., July 11; Custer, altitude 1,600 m., July 14; Hot Springs, altitude 1,050 m., August 8 (No. 696).

Epilobium drummondii Haussk. Monogr. Gatt. Epil. 271 (1884).

Two forms were met with. One was tall, sometimes 5 dm. high, stringy, with narrow leaves: Rochford, altitude 1,700 m., July 12 (No. 697). The other was lower, with broader, ovate-lanceolate leaves sinuately toothed, sessile and half-clasping. Sips Spring, in the Limestone District, altitude 1,800 m., July 28 (No. 698).

Epilobium hornemanni Reichenb. Icon. Crit. ii, 73 (1824).

Only a few depauperate plants collected at Sips Spring together with the preceding (No. 699).

Epilobium paniculatum Nutt.; Torr. & Gr. Fl. i, 490 (1840).

Custer, altitude 1,700 m., August 21 (No. 574).

Gayophytum ramosissimum Torr. & Gr. Fl. i, 513 (1840).

Hills: Rochford, altitude 1,700 m., July 12; Bull Springs, altitude 1,900 m., July 26 (No. 700).

Œnothera biennis L. Sp. Pl. i, 346 (1753).

This is evidently native in western Nebraska, as well as in the Black Hills. In general habit it differs much from *O. biennis* of Europe. Rochford, altitude 1,600 m., July 11 (No. 701).

Another form, somewhat like the preceding, but not strigose, was also found. The pubescence is fine, silky, appressed; radical leaves many, obovate, about 2.5 cm. long; calyx tube nearly 4 cm. long, lobes linear-lanceolate about 1.25 cm. long; petals broadly obovate; pod linear-oblong, only a little narrower upward. Custer, altitude 1,700 m., July 15 (No. 702).

Œnothera sinuata L. Mant. 228 (1767).

Only a few small specimens secured at Hot Springs, altitude 1,100 m., June 14 (No. 703).

Œnothera albicaulis Pursh, Fl. ii, 733 (1814), not Nutt.; *E. pinnatifida* Nutt. Gen. i, 245 (1818).

The plant is very variable: Hot Springs, altitude 1,100 m., June 16; Hermosa, altitude 1,000 m., June 23; Custer, altitude 1,700 m., July 16 (No. 704).

Œnothera pallida leptophylla (Nutt.) Torr. & Gr. Fl. i, 495 (1838); *E. leptophylla* Nutt.; Torr. & Gr. loc. cit., as synonym; *E. albicaulis* Nutt. Gen. i, 245 (1818), not Pursh.

The typical *E. pallida* has more or less runcinate-toothed leaves. Broken soil: Custer, altitude 1,700 m., July 15 (No. 705).

Œnothera coronopifolia Torr. & Gr. Fl. i, 495 (1840).

Sandy soil: Custer, altitude 1,700 m., June 4; Hot Springs, altitude 1,100 m., June 15 (No. 706).

Œnothera cæspitosa Nutt. Fraser's Cat. (1813).

Battle Mountain, east of Hot Springs, altitude 1,200 m., June 15 (No. 707).

Œnothera serrulata Nutt. Gen. i, 246 (1818).[1]

Fall River Falls, altitude 1,000 m., June 17; Rapid City, altitude 1,050 m., June 25; Elk Canyon, altitude 1,200 m., June 29 (No. 708).

Gaura coccinea Pursh, Fl. ii, 733 (1814).

Hot Springs, altitude 1,100 m., June 13 (No. 709).

A form, perfectly smooth, with white bark which peels off like that of *Œnothera pallida*, was collected at Custer, altitude 1,700 m., July 15 (No. 710). This form is also found in western Nebraska, where I collected it in 1890 and 1891.

Gaura parviflora Dougl.; Hook. Fl. Bor. Amer. i, 208 (1834).

Hot Springs, altitude 1,050 m., August 2 (No. 711).

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[1] Gray includes in his list, in Newton & Jenney's Report, also *E. chrysantha* Mx. (*E. pumila*), which must be an error, as that plant is strictly an Atlantic coast species.

Circæa alpina L. Sp. Pl. i, 9 (1753).

The specimens have less toothed leaves than usually, suggesting *C. pacifica;* but evidently they are not distinct from *C. alpina*. Shaded, damp place at the foot of Buckhorn Mountain, altitude 1,700 m., July 16 (No. 712).

LOASACEÆ.

Mentzelia decapetala (Pursh) Urban & Gilg, in Engler and Prantl. Nat. Pfl. iii Teil, 6 Abt. a, 111 (1894); *Bartonia decapetala* Pursh; Sims, Bot. Mag. xxxvi, t. 1487 (1812).

Bartonia ornata[1] is two years later and must give way to the older name. Rare: Hot Springs, altitude 1,100 m., August 9 (No. 713).

Mentzelia nuda (Pursh) Torr. & Gr. Fl. i, 535 (1840); *Bartonia nuda* Pursh, Fl. i, 328 (1814).

Rare: Hot Springs, altitude 1,050 m., August 3 (No. 714).

Mentzelia oligosperma Nutt.; Sims, Bot. Mag. xlii, t. 1760 (1815).

This was collected by Albert F. Woods near Hot Springs, but was not obtained by the writer.

CACTACEÆ.

Cactus missouriensis (Sweet) Kuntze, Rev. Gen. Pl. i, 259 (1891); *Mamillaria missouriensis* Sweet, Hort. Brit. 171 (1827).

Custer, altitude 1,650 m., June 4; Hot Springs, altitude 1,100 m., June 15 (No. 715).

Opuntia humifusa Raf. Ann. Nat. 15 (1820); *O. rafinesquii* Engelm. Pac. R. Rep. iv, 41 (1854).

Hills, 15 miles east of Custer, altitude 1,400 m., July 23 (No. 716).

Opuntia fragilis (Nutt.) Haw. Syn. Pl. Succ. Suppl. 82 (1819); *Cactus fragilis* Nutt. Gen. i, 296 (1818).

Plant only, collected near Minnekahta, altitude 1,300 m., August 5 (No. 717).

UMBELLIFERÆ.

Adorium tenuifolium (Nutt.) Kuntze, Rev. Gen. Pl. i, 264 (1891); *Musenium tenuifolium* Nutt.; Torr. & Gr. Fl. i, 642 (1840).

Very variable in size, according to the locality. The specimens from Custer, altitude 1,700 m., June 4 and August 1, seem to be typical, therefore like those of western Nebraska. Those from Hot Springs, altitude 1,100 m., June 13, growing in a more shaded locality, among gypsum rocks, are large with more striate scape. Those from the exposed granite rocks near Harneys Peak, altitude 2,200 m., June 8, are tufted, very low and delicate (No. 718).

Adorium hookeri (Torr. & Gr.); *Musenium divaricatum hookeri* Torr. & Gr. Fl. i, 642 (1840); *Musenium trachyspermum* Nutt.; Torr. & Gr., loc. cit., lower on the page.

Hermosa, altitude 1,000 m., June 22 (No. 719).

Carum carui L. Sp. Pl. i, 263 (1753).

The ribs of the fruit have each a bundle of strengthening cells and a small oil tube, a fact that I have not seen pointed out.

Near a small brook, 3 miles north of Deadwood, altitude 1,400 m., July 5 (No. 720).

Carum gairdneri (Nutt.) Benth. & Hook. Gen. Pl. i, 891 (1867); *Edosmia gairdneri* Nutt.; Torr. & Gr. Fl. i, 612 (1840).

This is included in Gray's list, in Newton & Jenney's Report,[2] but no specimens have been seen by the author from the region.

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[1] Pursh, Fl. i, 326 (1814).

[2] Geol. Surv. Black Hills, 533 (1880).

Zizia cordata (Walt.) Koch, Gen. Trib. Pl. Umb. 129 (1825); *Smyrnium cordatum* Walt. Fl. Car. 114 (1788).

This is the *Thaspium trifoliatum* of Newton & Jenney's Report.

Custer, altitude 1,650 m., June 2; Little Elk Canyon, altitude 1,100 m., June 28; Elk Canyon, altitude 1,200 m., June 29 (No. 721).

Berula erecta (Huds.) Coville, Contr. Nat. Herb. iv, 115 (1893); *Sium erectum* Huds. Fl. Angl. 103 (1762).

Hot Springs, altitude 1,050 m., August 10 (No. 722).

Cicuta virosa maculata (L.) Coult. & Rose, Rev. Umb. 130 (1888); *Cicuta maculata* L. Sp. Pl. i, 256 (1753).

Little Elk Canyon, altitude 1,100 m., June 28 (No. 723).

Osmorrhiza nuda Torr. Pac. R. Rep. iv, 93 (1856).

Elk Canyon, altitude 1,300 m., June 29; Lead City, altitude 1,600 m., July 6 (No. 724).

Osmorrhiza aristata (Thunb.) Rydberg, Bot. Surv. Neb. iii, 37 (1894); *Charophyllum aristatum* Thunb. Fl. Jap. 119 (1784); *O. longistylis* DC. Prodr. iv, 232 (1830).

Elk Canyon, altitude 1,200 m., June 29; Lead City, altitude 1,600 m., July 6; Hot Springs, altitude 1,100 m., (No. 725).

Cymopterus montanus Torr. & Gr. Fl. i, 624 (1840).

In fruit only: Hot Springs, altitude 1,100 m., June 14 (No. 726).

Cymopterus acaulis (Pursh) Rydberg, Bot. Surv. Neb. iii, 38 (1894); *Selinum acaule* Pursh, Fl. ii, 732 (1814); *Thapsia glomerata* Nutt. Gen. i, 184 (1818).

Only one specimen, collected while the train stopped at Edgemont, altitude 1,053 m., May 27 (No. 727).

Peucedanum villosum Nutt.; Wats. Bot. King Surv. v, 131 (1871).

Very common around Hot Springs, altitude 1,100 m., June 13 (No. 728)

Pastinaca sativa L. Sp. Pl. i, 262 (1753).

Escaped, along Rapid Creek, 6 miles above Rapid City, altitude 1,100 m., July 25 (No. 729).

Heracleum lanatum Mx. Fl. Bor. Amer. i, 166 (1803).

Rapid Creek above Rapid City, altitude 1,100 m., June 25; Little Elk, altitude 1,100 m., June 28 (No. 730).

Sanicula canadensis L. Sp. Pl. i, 235 (1753).

Elk Canyon, altitude 1,200 m., June 29; Lead City, altitude 1,600 m., July 6 (No. 731.)

ARALIACEÆ.

Aralia nudicaulis L. Sp. Pl. i, 274 (1753).

Little Elk Canyon, altitude 1,200 m., June 28; Elk Canyon, altitude 1,300 m., June 29; Lead City, altitude 1,700 m., July 6; Custer, altitude 1,600 m., August 15 (No. 732).

At one place in Little Elk Canyon all specimens differed from the usual form in being lower, the leaves being only 2 dm. or less long, while in the ordinary form they are 3 dm.; the umbels 1 to 4 on erect branches (in the ordinary form they are more or less spreading); flowers larger and blooming before the leaves are fully developed. (No. 733).

CORNACEÆ.

Cornus canadensis L. Sp. Pl. i, 118 (1753).

Lead City, altitude 1,600 m., July 4; Sylvan Lake, altitude 2,000 m., August 17 (No. 734).

Cornus baileyi Coult. & Evans, Bot. Gaz. xv, 37 (1890).

I refer this here with doubt, as I did not see it in fruit. The pubescence of the peduncles is woolly, and that of the lower surface of the leaves is more or less mixed

with woolly hairs. The leaves are narrower than in the next, of which it may be a more hairy variety, and the bark of the branches is browner and pubescent. It may also be a narrow-leafed form of *C. pubescens*.

Little Elk Canyon, altitude 1,200 m., June 28; Rochford, altitude 1,700 m., July 11 (No. 735).

Cornus stolonifera Mx. Fl. i, 92 (1803).

The bark is purplish red, the pubescence silky. In fruit only: Sylvan Lake, altitude 1,900 m., August 17 (No. 736).

CAPRIFOLIACEÆ.

Adoxa moschetellina L. Sp. Pl. i, 367 (1753).

Only a few small specimens in bud were secured, below Sylvan Lake, altitude 2,000 m., June 3, and a few in fruit, badly damaged by rust, under a rock near Sips Spring, in the Limestone District, altitude 1,900 m., July 28 (No. 737).

Sambucus racemosa L. Sp. Pl. i, 270 (1753).

Three forms belonging here were collected. In one the annual shoot and the peduncles are more or less roughish-pubescent and warty; leaves oblong-lanceolate, long acuminate, closely serrate; cyme many-flowered, roundish. The mature fruit was not seen. The cyme resembles that of *S. melanocarpa*, but the leaves are more like those of *S. racemosa* and the flowers are "dull white, drying brownish." Canyon, north of Runkels, altitude 1,300 m., July 30; Custer, altitude 1,700 m., July 14 (No. 738).

A form which I think is more typical has the shoots perfectly smooth and light colored, leaflets ovate-lanceolate with shorter acumination, cyme longer, but smaller; fruit bright red as in *Shepherdia argentea*. Sylvan Lake, altitude 2,000 m., August 17 (No. 739).

Together with this form was another in every respect like it, except that the berries were amber yellow, resembling and being the analogue of the amber-colored variety of Shepherdia growing in western Nebraska (No. 740).

Viburnum opulus L. Sp. Pl. i, 268 (1753).

Canyon north of Runkels, altitude 1,300 m., June 30 (No. 741).

Viburnum lentago L. Sp. Pl. i, 268 (1753).

The margined petioles are often rufous-pubescent as they should be in *V. pruni-folium*, which is said to grow in the Black Hills. I think, however, that this has been mistaken for that. Little Elk, altitude 1,200 m., June 28; Runkels, altitude 1,300 m., June 30 (No. 742).

Linnæa borealis L. Sp. Pl. ii, 631 (1753).

Common in the Northern Hills, but also seen in the Harney Range. Elk Canyon, altitude 1,200 m., June 29; Lead City, altitude 1,600 m., July 6 (No. 743).

Symphoricarpos racemosus pauciflorus Robbins, Gray, Man. ed. 5, 203 (1867).

Common: Little Elk Canyon, altitude 1,200 m., June 28; Elk Canyon, altitude 1,300 m., June 29; Lead City, altitude 1,600 m., July 6; Rochford, altitude 1,700 m., July 12 (No. 744).

Symphoricarpos occidentalis Hook. Fl. Bor. Amer. i, 285 (1834).

Very variable; flowers few or many; style glabrous or sparsely villose; stout or slender; leaves entire or lobed, large and thick or small and thin. Some forms approaching the preceding. Elk Canyon, altitude 1,200 m., June 29; Hot Springs, altitude 1,100 m., August 9; Custer, altitude 1,700 m., August 12 (No. 745).

A form with thin, ovate, acute or acuminate, or even pointed leaves, and a thin, less bearded corolla was collected at the last place, August 19 (No. 746). The same has been collected by Dr. Chas. E. Bessey in Colorado.

Lonicera hirsuta glaucescens, var. nov.; *Lonicera parviflora* var.? Torr. & Gr. Fl. ii, 7 (1840), partly; *Lonicera douglasii* Hook. Fl. Bor. Amer. i, 282 (1833) (?), not *Caprifolium douglasii* Lindl. Trans. Hort. Soc. vii, 244, which is *L. hirsuta* proper.

Leaves 3 to 5 cm. long and 1.5 to 3 cm. wide, smooth above, slightly glaucous beneath, not ciliate, generally only the upper pair connate; corolla about 1.5 cm. long, pubescent on the outside, strongly gibbose at the base of the tube, yellow, changing into reddish; stem smooth; bark first green, afterwards grayish straw-colored, more or less shreddy.

It differs from the true *L. hirsuta* in the smaller leaves, which are perfectly smooth above and decidedly glaucous beneath (in *L. hirsuta* they are seldom glaucous), in the corolla, which is more gibbose, and in the smooth and shreddy stem. It may be a distinct species. It resembles somewhat *L. glauca*, from which it differs in the longer, hairy, and gibbose corolla. It is sometimes a low shrub, sometimes high-climbing. The only specimen in the National Herbarium, except those from the Black Hills, was collected by S. M. Tracy in the Rocky Mountains in 1888 (no locality given). In the herbarium of Harvard University are the following specimens: In Dr. Gray's collections, a fragmentary one labeled "*Lonicera douglasii* Fl. Bor. Am. Hooker misit January, 1835;" and another labeled "*L. hirsuta* var. *douglasii* Hooker approaching *glauca*." The others were probably received later, as there are no indications that Dr. Gray had ever studied them, viz: *Lonicera glauca* Hill, Agricultural College, Ingham County, Mich., 1860 (no collector given); Ex. Herb. Thurber, coll. T. J. Hale, *Lonicera douglasii* DC., hab. Ripon, Wis., 1861; 150 *Lonicera hirsuta* (*L. douglasii* Hook). "River That Tums," July 13, 1879, coll. J. Macoun, F. L. S. Railway Survey; 96½ Herb. of Wm. Werner, *Lonicera glauca* Hill [corrected to], *L. hirsuta* Eaton, Painesville, Ohio, 1890; Herb. L. H. Bailey, jr., *Lonicera glauca* Hill, Lansing, Mich., 1886.

Little Elk, altitude 1,200 m., June 28; Lead City, altitude 1,600 m., July 6 (No. 747).

RUBIACEÆ.

Galium aparine L. Sp. Pl. i, 108 (1753).

Hot Springs, altitude 1,050 m., June 13 (No. 748).

Galium triflorum Mx. Fl. i, 80 (1803).

Elk Canyon, altitude 1,200 m., June 29; Lead City, altitude 1,600 m., July 6 (No. 749).

Galium boreale L. Sp. Pl. i, 108 (1753).

Hot Springs, altitude 1,100 m., June 15; Hermosa, altitude 1,100 m., June 22; Rapid City, altitude 1,000 m., June 25; Elk Canyon, altitude 1,200 m., June 29 (No. 750).

VALERIANACEÆ.

Valeriana edulis Nutt.; Torr. & Gr. Fl. ii, 48 (1841).

Rochford, altitude 1,700 m., July 12; Oreville, altitude 1,700 m., July 16 (No. 751).

Valeriana sylvatica Banks; Richards. Bot. App. 730 (1823).

Rochford, altitude 1,600 m., June 12; Oreville, altitude 1,700 m., July 16 (No. 752).

COMPOSITÆ.

Lacinaria scariosa (L.) Hill, Veg. Syst. iv, 49 (1762); *Serratula scariosa* L. Sp. Pl. ii, 818 (1753).

Custer, altitude 1,600 m., Aug. 1 (No. 753).

Lacinaria punctata (Hook.) Kuntze, Rev. Gen. Pl. i, 349 (1891); *Liatris punctata* Hook. Fl. Bor. Amer. i, 306 (1833).

Custer, altitude 1,600 m., August 1; Hot Springs, altitude 1,100 m., August 3 (No. 754).

Kuhnia glutinosa Ell. Bot. S. Car. & Georg. ii, 292 (1821–1824); *K. eupatorioides glutinosa* Hitchcock, Trans. St. Louis Acad. v, 498 (1891).

Hot Springs, altitude 1,100 m., August 2, (No. 755).

Grindelia squarrosa (Pursh) Dunal, in DC. Prodr. v, 315 (1836); *Donia squarrosa* Pursh, Fl. ii, 559 (1814).

Hot Springs, altitude 1,100 m., August 2 (No. 756).

Two depauperate specimens in bloom (several plants were seen) were collected above Fall River Falls, altitude 1,000 m., June 17. These two had narrow leaves, more toothed than usual, and I took them at first to be *G. nana* Nutt., but they must belong to *G. squarrosa* (No. 757).

Chrysopsis villosa (Pursh) Nutt. Gen. ii, 151 (1818); *Amellus villosus* Pursh, Fl. ii, 564 (1814).

Sandy soil: Rochford, altitude 1,600 m., July 12; Custer, altitude 1,650 m., July 12, (No. 758).

Chrysopsis villosa canescens (DC.) Gray, Syn. Fl. i, pt. ii, 123 (1884); *Aplopappus* (?) *canescens* DC. Prodr. v, 349 (1836).

Custer, altitude 1,650 m., July 15; Hot Springs, altitude 1,100 m., August 2 (No. 759).

Eriocarpum grindelioides Nutt. Trans. Amer. Phil. Soc. ser. 2, vii, 321 (1841); *Aplopappus nuttallii* Torr. & Gr. Fl. ii, 242 (1842). Gypsum rocks above Hot Springs, altitude 1,100 m., August 2 (No. 760).

Eriocarpum spinulosum (Pursh) Greene, Erythea, ii, 108 (1894); *Amellus spinulosus* Pursh, Fl. ii, 564 (1814); *Aplopappus* (?) *spinulosus* DC. Prodr. v, 347 (1836).

Rare: Hot Springs, altitude 1,100 m., August 2 (No. 761).

Solidago erecta Pursh, Fl. ii, 542 (1814).

This is the *S. speciosa angustata* Torr. & Gr., of Newton & Jenney's Report. I refer it doubtfully here. It does not agree with the original description by Pursh, being perfectly smooth except the margins of the leaves, which are scabrous. It agrees well with the description of *S. erecta* by Elliott.[1] Gray[2] regards the two as the same species notwithstanding the pubescence attributed to the first. It is near *S. speciosa*, but the primary veins are more or less prominent and often looped.

Hilly places: Custer, altitude 1,700 m., August 16 (No. 762).

Solidago missouriensis Nutt. Journ. Acad. Phil. vii, 32 (1834).

Very variable. The form held as the typical one, that is, stouter with spreading panicle of recurved branches, was collected at Custer, altitude 1,700 m., August 14 (No. 763). This is, however, not the original *S. missouriensis*, but should, if held separate, be called variety *glaberrima* (*S. glaberrima* Martens). The true *S. missouriensis* was also collected, viz, at Custer, altitude 1,700 m., August 16 (No. 764). This was named variety *montana* by Dr. Gray. Another form was found with broad leaves, the lower often 1.5 cm. wide, the stem tall, 5 dm. high, panicle with upright branches and large heads. It may be the variety *extraria* Gray, or, perhaps, a hybrid of *S. missouriensis* and the preceding, together with which it grew. Custer, August 16 (No. 765).

Solidago rupestris Raf. Ann. Nat. 14 (1820).

Owing to the meager material, the determination is doubtful. It may perhaps be a narrow and thin-leafed form of *S. serotina* Ait. Little Elk, altitude 1,100 m., June 28 (No. 766).

Solidago canadensis L. Sp. Pl. ii, 878 (1753).

Custer, altitude 1,650 m., August 1 (No. 767).

Solidago canadensis procera (Ait.) Torr. & Gr. Fl. ii, 224 (1842); *S. procera* Ait. Hort. Kew. iii, 211 (1789).

Custer, altitude 1,700 m., August 1 (No. 1207).

Solidago nemoralis Ait. Hort. Kew. iii, 213 (1789).

My specimens are more or less scabrous, some have axillary clusters and resemble somewhat *S. bicolor concolor*. Custer, altitude 1,700 m., August 16 (No. 768).

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[1] Bot. S. Car. & Georg. i, 385 (1817).

[2] Proc. Amer. Acad. viii, 308 (1870).

Solidago rigida L. Sp. Pl. ii, 880 (1753).

Much smaller than the form common in eastern Nebraska, 3 to 6 dm. high, more cinereous; corymb more open and heads smaller; radical and lower cauline leaves gradually acuminating into a winged petiole, all with a clasping but not decurrent base. Custer, dry land, altitude 1,700 m., August 16 (No. 769).

Euthamia graminifolia (L.) Nutt. Gen. ii, 162 (1818); *Chrysocoma graminifolia* L. Sp. Pl. ii, 841 (1753); *Solidago lanceolata* L. Mant. 114 (1767).

The corymbs in all specimens seen in the Black Hills are unusually small and dense with larger heads. Hot Springs, altitude 1,100 m., August 10 (No. 770).

Aster sibiricus L. Sp. Pl. ii, 872 (1753).

Shaded hillsides: Custer, altitude 1,700 m., August 13; Rochford, altitude 1,700 m., July 12 (No. 771). All specimens are unusually low.

Aster lævis L. Sp. Pl. ii, 876 (1753).

All the specimens are small, some very low and slender, with narrowly lanceolate leaves. Custer, altitude 1,700 m., August 16 (No. 772).

Aster multiflorus incanopilosus (Lindl.) Rydb. Contr. Nat. Herb. iii, 163 (1895); *A. ramulosus incanopilosus* Lindl.; Hook. Fl. Bor. Amer. ii, 13 (1834); *A. multiflorus commutatus* Torr. & Gr. Fl. ii, 124 (1841).

Custer, altitude 1,600 m., August 16 (No. 773).

Aster patulus Lam. Encycl. i, 308 (1783).

Like *A. prenanthoides* Muhl., but the base of the leaves is not cordate at all. Only a few specimens secured. Custer, altitude 1,700 m., August 13 (No. 774).

Aster junceus Ait. Hort. Kew. iii, 204 (1789).

See my remark on this species, this volume, p. 163. The leaves are linear, 1-nerved, with slightly revolute margins.

Wet meadow: Custer, altitude 1,600 m., August 15 (No. 775).

Aster salicifolius Lam. Encyl. i, 306 (1783).

Meadow: Custer, altitude 1,600 m., August 15 (No. 776).

Aster ptarmicoides (Nees) Torr. & Gr. Fl. ii, 160 (1841); *Doellingeria ptarmicoides* Nees, Gen. & Sp. Ast. 183 (1832).

Limestone District, near Bull Springs, altitude 1,900 m., July 25 (No. 777).

Aster falcatus Lindl.; DC. Prodr. v, 241 (1836).

In Gray's list, Newton & Jenney's Report[1]; no specimens from this region seen by the writer.

Aster paniculatus Lam. Encycl. i, 306 (1783); *A simplex* Willd. Enum. 887 (1809).

In Gray's list only.[2]

Aster tanacetifolius H. B. K. Nov. Gen. iv, 95 (1820).

In Gray's list only.[2]

Erigeron asper Nutt. Gen. ii, 147 (1818).

More or less strigose all over. Generally 3 to 5 dm. high, with several heads; but in higher altitudes they are only 2 to 2.5 dm. high, with 1 to 3 heads. Former state, Rochford, altitude 1,600 m., July 11; latter state, Limestone District, July 26 (No. 778).

Erigeron subtrinervis Rydberg, Mem. Torr. Club. v, 328 (1894); *E. glabellus mollis* Gray, Proc. Acad. Phila. 1863, 64 (1863), not *E. mollis* D. Don, Prodr. Fl. Nep. 172 (1825).

Plant hairy throughout, from grayish scabro-strigose to soft-pubescent, leafy to the top; leaves thin, more or less distinctly triple-nerved, the lower oblanceolate, petioled, the upper oblong to ovate-lanceolate, sessile and half-clasping; heads 1 to 5, corymbose, 1.5 cm. wide and 0.75 cm. high; rays 0.75 to 1 cm. long, blue or flesh color; involucre hirsute.

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[1] Geol. Surv. Black Hills, 534 (1880).

[2] Loc. cit.

Gray (loc. cit.) says: "From the shape of the leaves, and their size and abundance up to the summit of the stem, this should rather be referred to *E. macranthum;* but the pubescence is strange for that species;" and in the Synoptical Flora he adds, "Perhaps a distinct species." I believe it to be distinct and rather more related to *E. macranthus* than to *E. glabellus;* in fact, it differs little from the former except in the pubescence, which is not only more copious but of a different nature, more resembling that of the hirsute forms of *E. glabellus.* In *E. macranthus* the bracts are nearly smooth, somewhat minutely glandular or puberulent; in *E. subtrinervis* they are covered with longer spreading hairs. I have named the species *E. subtrinervis,* from the fact that the lower lateral veins are often stronger, making the leaves look as if triple-nerved, a character often seen in *E. speciosus,* sometimes in *E. macranthus,* though I have not seen it in *E. glabellus.* The leaves are generally thinner than in any of these three related species.

In woods: Custer, altitude, 1,700 m., August 16 (No. 779).

Erigeron pumilus Nutt. Gen. ii, 147 (1818).

Dry table-lands: Hot Springs, altitude 1,100 m., June 13 (No. 780).

Erigeron compositus Pursh, Fl. ii, 535 (1814).

All my specimens are strictly scapose and densely matted. Exposed rocks in the Limestone District, altitude 1,900 m., July 27. Also seen near the Needles, altitude about 2,100 m., in the Harney Range (No. 781).

Erigeron canus Gray, Pl. Fendl. 67 (1849).

Dry table-lands: Hot Springs, altitude 1,100 m., June 13 (No. 782).

Erigeron philadelphicus L. Sp. Pl. ii, 863 (1753).

Near water: Hot Springs, altitude 1,050 m., June 17; Hermosa, altitude 1,000 m., June 22; Elk Canyon, altitude 1,200 m., June 29 (No. 783).

Erigeron flagellaris Gray, Pl. Fendl. 68 (1849).

Rich soil: Hot Springs, altitude 1,050 m., June 17; Hermosa, altitude 1,000 m., June 22; Buckhorn Mountain, near Custer, altitude 1,800 m., July 14. The specimens from the latter place, have much smaller radical leaves than the rest (No. 784).

Erigeron ramosus beyrichii (Fisch. & Mey.) Smith & Pound, Bot. Surv. Nebr. ii, 11 (1893); *Stenactis beyrichii* Fisch. & Mey. Ind. Sem. Petrop. 27 (1824).

Below Buckhorn Mountain, Custer, altitude 1,700 m., August 14 (No. 785).

Erigeron armerifolius Turcz.; DC. Prodr. v, 291 (1836).

Radical leaves numerous, spatulate. Wet meadow, Custer, altitude 1,700 m., August 20 (No. 786).

Erigeron canadensis L. Sp. Pl. ii, 863 (1753).

This is rare in the Black Hills. Custer, altitude 1,650 m., August 20 (No. 787). A depauperate form, resembling much *E. divaricatus,* was collected in Ruby Glen, Custer, altitude 1,700 m., August 20 (No. 788).

Filago prolifera (Nutt.) Britton, Mem. Torr. Club, v, 329 (1894); *Evax prolifera* Nutt.; DC. Prodr. v, 459 (1836).

Barren Hills: Hot Springs, altitude 1,100 m., June 13 (No. 789).

Antennaria dioica (L.) Gartn. Fruct. ii, 410 (1791); *Gnaphalium dioicum* L. Sp. Pl. ii, 850 (1753).

The typical *A. dioica* has leaves 1 to 2 cm. long, and 0.3 to 0.6 cm. wide, silvery white on both sides; bracts all obtuse, the papery portion white or pinkish red. Borders of woods: Hot Springs, altitude 1,100 m., June 13; Rochfort, altitude 1,600 m., July 11 (No. 790).

A peculiar form with several crowded heads, and often acute bracts, I also refer here. The bracts are of livid-brownish color, approaching *A. alpina* in this respect, but the plant is in every respect larger. Custer, altitude 1,700 m., July 4 (No. 792).

Antennaria dioica parvifolia (Nutt.) Torr. & Gr. Fl. ii, 431 (1840); *Antennaria parvifolia* Nutt. Trans. Amer. Phil. Soc. n. ser. vii, 406 (1841).

Radical leaves narrow, oblanceolate, more or less revolute, finely silvery on both sides; flowering stem slender, bearing smaller heads with brightly rose-colored bracts. The plant is more diffusely spreading. Prairie: Rochford, altitude 1,600 m., July 12 (No. 791).

Antennaria plantaginifolia (L.) Richards. Bot. App. ed. 2, 30 (1823); *Gnaphalium plantaginifolium* L. Sp. Pl. ii, 850 (1753).

This species is very variable, at least if all the western forms belong to it. The typical form with large, thin, 3-ribbed leaves was not met with. What I take for an alpine form of this species was collected early in the spring, around Custer, altitude 1,650 m., May 30 (No. 794). This is low, 7 to 10 cm. high, with smaller heads, radical leaves obovate or oblong, about 3 cm. long, glabrous above, white beneath.

The other two forms collected belong to the western form of *A. plantaginifolia*, which perhaps is distinct from the eastern. The leaves are smaller, 1.5 to 4 cm. long, silky on both sides, and seldom 3-nerved. In one of the forms the leaves are about 3 cm. long, the stem more robust and more floccose. Hot Springs, altitude 1,100 m., June 13; Hermosa, altitude 1,050 m., June 2; Lead City, altitude 1,700 m., July 4 (No. 793). The other form is more slender and less floccose, the leaves about one-half the size of those of the last. This is the same as No. 173 of my western Nebraska collection. Lead City, altitude 1,700 m., July 6 (No. 795).

Antennaria margaritacea (L.) Hook. Fl. Bor. Amer. i, 329 (1833); *Gnaphalium margaritaceum* L. Sp. Pl. i, 85 (1753).

Englewood, altitude 1,600 m., August 13 (No. 796).

Iva xanthifolia Nutt. Gen. ii, 185 (1818).

Waste places, rare: Custer, altitude 1,600 m., August 19 (No. 797).

Ambrosia psilostachya DC. Prodr. v, 526 (1836).

Rare: Hot Springs, altitude 1,700 m., August 2 (No. 793).

Ambrosia artemisiæfolia L. Sp. Pl. ii, 988 (1753).

Custer, altitude 1,650 m., August 11 (No. 799).

Brauneria pallida (Nutt.) Britton, Mem. Torr. Club, v, 333 (1895); *Rudbeckia pallida* Nutt. Journ. Acad. Phila. v, 77 (1834); *Echinacea angustifolia* DC. Prodr. v, 554 (1836).

Prairie: Custer, altitude 1,600 m., August 1 (No. 800).

Rudbeckia hirta L. Sp. Pl. ii, 907 (1753).

Meadows: Rochford, altitude 1,600 m., July 12; in the Limestone District, altitude 1,900 m., July 26 (No. 801). One specimen was very leafy, with narrow linear-lanceolate leaves.

Lepachys columnaris (Pursh) Torr. & Gr. Fl. ii, 315 (1841); *Rudbeckia columnaris* Pursh, Fl. ii, 575 (1814).

Rare: Only a few specimens secured at Custer, altitude 1,650 m., August 1 (No. 802).

Helianthus annuus L. Sp. Pl. ii, 904 (1753).

Custer, altitude 1,600 m., August 1 (No. 803).

Helianthus petiolaris Nutt. Journ. Acad. Phila. ii, 115 (1821).

Only a few specimens were secured; all had some of the leaves opposite. Hot Springs, altitude 1,100 m., August 2 (No. 804).

Helianthus scaberrimus Ell. Bot. S. Car. & Georg. ii, 423 (1824); *H. rigidus* Desf. Cat. Hort. Paris, ed. 3, 184 (1829).

Custer, altitude 1,700 m., August 1 (No. 805).

Helianthus maximiliani Schrad. Ind. Sem. Hort. Goett. (1835).

Custer, altitude 1,700 m., August 15 (No. 806).

Helianthella quinquenervis (Hook.) Gray, Proc. Amer. Acad. xix, 10 (1883); *Helianthus quinquenervis* Hook. Lond. Journ. Bot. vi, 247 (1847).

The leaves in my specimens are as often alternate as opposite, and the plant is much taller than the specimens in the National Herbarium.

Hills: Limestone District near Sips Spring, altitude 1,900 m., July 27 (No. 807).

Balsamorhiza sagittata (Pursh) Nutt. Trans. Amer. Phil. Soc. vii, 350 (1841); *Buphthalmum sagittatum* Pursh, Fl. ii, 564 (1814).

It was collected in fruit only on hills near Sips Spring, altitude 1,900 m., July 27 (No. 808).

Bidens lævis (L.) B. S. P. Cat. Pl. N. Y. 29 (1888); *Helianthus lævis* L. Sp. Pl. ii, 906 (1753).

All the specimens collected were low, with short rays. Pringle, altitude 1,500 m., August 6 (No. 809). Some were very slender; leaves about 2 to 3 cm. long, not connate; heads about 6 mm. long, few-flowered; sparingly strigose (No. 810).

Hymenopappus filifolius Hook. Fl. Bor. Amer. i, 317 (1834).

Hot Springs, altitude 1,100 m., June 13 and August 3 (No. 811).

Ptilepida acaulis (Pursh) Britton, Mem. Torr. Club, v, 339 (1894); *Gaillardia acaulis* Pursh, Fl. ii, 743 (1814); *Actinella acaulis* Nutt. Gen. ii, 173 (1818).

Dry hills: Hot Springs, altitude 1,100 m., June 12; Lead City, altitude 1,800 m., July 4 (No. 812).

Gaillardia aristata Pursh, Fl. ii, 573 (1814).

Prairies: Rochford, altitude 1,600 m., July 12; Limestone District, altitude 1,900 m., July 26 (No. 813).

Dysodia papposa (Vent.) Hitch. Trans. St. Louis Acad. v, 503 (1891); *Tagetes papposa* Vent. Hort. Cels. t. 36 (1800).

Waste places: Hot Springs, altitude 1,050 m., August 8 (No. 814).

Anthemis cotula L. Sp. Pl. ii, 894 (1753).

Hot Springs, altitude 1,050 m., August 2 (No. 815).

Achillea millefolium L. Sp. Pl. ii, 899 (1753).

Elk Canyon, altitude 1,200 m., June 29; Lead City, altitude 1,600 m., July 4; Hot Springs, altitude 1,100 m., August 2 (No. 816).

Artemisia canadensis Mx. Fl. ii, 128 (1803).

Dry places: Custer, altitude 1,700 m., August 15 (No. 817).

Artemisia dracunculoides Pursh, Fl. ii, 742 (1814).

Custer, altitude 1,700 m., August 15 (No. 818).

Artemisia frigida Willd. Sp. Pl. iii, 1838 (1801).

Dry places: Custer, altitude 1,700 m., August 19 (No. 819).

Artemisia gnaphalodes Nutt. Gen. ii, 143 (1818).

Custer, altitude 1,700 m., August 19 (No. 820).

Petasites sagittata (Pursh) Gray, Bot. Cal. i, 407 (1876); *Tussilago sagittata* Pursh, Fl. ii, 531 (1814).

A large patch found on Rapid Creek, above Rochford, altitude 1,650 m., July 12, but only three specimens in fruit secured (No. 821).

Arnica cordifolia Hook. Fl. Bor. Amer. i, 331 (1834).

On shaded hillsides: Elk Canyon, altitude 1,200 m., July 29; Lead City, altitude 1,600 m., July 4; Rochford, altitude 1,700 m., July 12 (No. 822).

Arnica alpina (L.) Olin, Monogr. Arn. Ups. 1799; *Arnica montana alpina* L. Sp. Pl. ii, 884 (1753).

In the Black Hills this is generally 3-cephalous, and 3 to 5 dm. high. Little Elk Canyon, altitude 1,100 m., July 28; Custer, altitude, 1,800 m., July 16 (No. 823).

Senecio rapifolius Nutt. Trans. Amer. Phil. Soc. vii, 409 (1841).

The specimens are unusually large, some being 6 dm. high. In shaded places among rocks: Custer, altitude 1,700 m., August 12 (No. 824).

Senecio lugens Richards. App. Frankl. Journ. 747 (1823).

In the specimens collected the leaves are unusually narrow and nearly entire.

The plant may be a form of the next. Rochford, altitude 1,650 m., July 11; Hot Springs, altitude 1,050 m., August 8 (No. 825).

Senecio integerrimus Nutt. Gen. ii, 165 (1818).

This resembles a specimen collected by Mr. Nicollet, which according to Torrey and Gray [1] is *S. integerrimus* Nutt. The other specimens in the National Herbarium seem to belong to some other species. The type specimens of Nuttall I have not seen. The bracts and the base of the involucre are somewhat fleshy. Prairie, near Squaw Creek, Hermosa, altitude 1,050 m., June 23 (No. 826).

Senecio balsamitæ Muhl.; Willd. Sp. Pl. iii, 1998 (1804).

Leaves very thin and wholly glabrous, bright green, the lower obovate, serrate. Lead City, altitude 1,600 m., July 6; Rochford, altitude 1,600 m., July 11; Custer, altitude 1,700 m., July 16 (No. 827).

Senecio plattensis Nutt. Trans. Amer. Phil. Soc. ser. 2, vii, 413 (1841).

Hot Springs, altitude 1,100 m., June 18 (No. 828).

Senecio canus Hook. Fl. Bor. Amer. i, 333 (1834).

This is a very variable species. Three forms were collected, one of them the typical. This is 3 to 5 dm. high, densely woolly; root leaves entire, broadly oblanceolate, oblong, or spatulate; 7 to 10 cm. long, 1 to 1.5 cm. wide. Battle Mountain, near Hot Springs, altitude 1,200 m., June 18; Lead City, altitude 1,700 m., July 4 (No. 829). The second form is somewhat like the last but greener with deciduous wool and thin leaves. It approaches somewhat the preceding species, especially as to the involucre, which is nearly glabrous. Lead City, altitude 1,600 m., July 6 (No. 830). The third is a low form with narrow leaves, the lower narrowly spatulate or oblanceolate, 3 to 7 cm. long and about 4 mm. wide, white woolly, with more or less revolute margins. Dry table-land: Hot Springs, altitude 1,100 m., June 13 (No. 831).

Carduus undulatus Nutt. Gen. ii, 130 (1818); *Cnicus undulatus* Gray, Proc. Amer. Acad. x, 42 (1874).

Custer, altitude 1,650 m., August 12 (No. 832).

Carduus undulatus ochrocentrus, nom. nov.; *Cnicus undulatus ochrocentrus* Gray, Proc. Amer. Acad. x, 43 (1874); *Cirsium ochrocentrum* Gray, Pl. Fendl. 110 (1849); *Cnicus ochrocentrus* Gray, Proc. Amer. Acad. xix, 57 (1883).

This is the northern form referred to *Carduus ochrocentrus*. The southern, that is, the original form, differs in being stouter and more white with broader bracts. Whether the latter is distinct from *C. undulatus* I am not prepared to decide. The northern form is, I think, only a variety, and differs only in the prickles of the involucre, which are much longer and stouter. Intermediate forms are sometimes seen.

Custer, altitude 1,650 m., August 1 (No. 833).

Carduus drummondii (Gray); *Cnicus drummondii* Gray, Proc. Amer. Acad. x, 40 (1874).

Some of the specimens are very near to the variety *acaulescens* Gray. Meadows: Custer, altitude 1,650 m., July 16 (No. 834).

Centaurea cyanus L. Sp. Pl. ii, 911 (1753).

Only one specimen collected: Roadside, not far from Hot Springs, altitude 1,100 m., August 2 (No. 835).

Hieracium canadense Mx. Fl. ii, 86 (1803).

The specimens referred to this species have much thinner, narrower, and less dentate leaves than the common form. Custer, altitude 1,650 m., July 12 (No. 836).

Hieracium umbellatum L. Sp. Pl. ii, 804 (1753).

The specimens of this have fewer heads than usual. Wet meadow: Rapid City, altitude 1,000 m., June 25 (No. 837).

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[1] Fl. ii, 439.

Hieracium sp.

A single specimen was found, together with the preceding, of a plant which resembles it as to the leaves, but has the stem hispid above, and the bracts broad (No. 838).

Hieracium fendleri Schultz Bip. Bonplandia, ix, 173 (1861).

The Black Hills are outside of the supposed range of this species, but the specimens agree fully with Gray's description and with specimens in the National Herbarium and the herbarium of the University of Nebraska. Rochford, on a dry hill, altitude 1,700 m., July 12 (No. 839).

Crepis runcinata (James) Torr. & Gr. Fl. ii, 487 (1843); *Hieracium runcinatum* James, Long Exped. i, 453 (1823).

The typical form, but with the leaves less runcinate. Hermosa, altitude 1,050 m., June 23; Whitewood, altitude 1,200 m., July 7; Rochford, altitude 1,700 m., July 11; Custer, altitude 1,700 m., July 16 (No. 840).

A stouter form, 4 to 5 dm. high, with broader leaves; heads larger; involucre of thicker bracts, with the peduncles and upper part of the stem densely covered with yellowish glands. A specimen of this form in the National Herbarium is labeled variety *hispidulosa* Howell, but I can not find any description. Meadow: Rapid City, altitude 1,000 m., July 25 (No. 841).

Prenanthes racemosa Mx. Fl. ii, 84 (1803).

Wet meadow: Custer, altitude 1,600 m., August 15 (No. 842).

Agoseris glauca (Pursh) Greene, Pittonia, ii, 176 (1891); *Troximon glaucum* Pursh, Fl. ii, 505 (1814).

Meadows: Rapid City, altitude 1,000 m., June 25; Elk Canyon, altitude 1,200 m., June 29 (No. 843).

Agoseris glauca parviflora (Nutt.); *Troximon parviflorum* Nutt. Trans. Amer. Phil. Soc. vii, 434 (1841).

Professor Greene regards this as a distinct species, stating that it differs in the leaves being strictly 2-ranked, a character which is, however, sometimes found in the true *A. glauca.*

Custer, altitude 1,650 m., July 16 (No. 844).

Agoseris scorsoneræfolia (Schrad.) Greene, Pittonia, ii, 177 (1891); *Ammogeton scorsoneræfolium* Schrad. Cat. Sem. Goett. 1 (1833).

Railroad embankment: Custer, altitude 1,650 m., July 16 (No. 845).

Taraxacum taraxacum (L.) Karst. Deutsch. Fl. 1138 (1880–1883); *Leontodon taraxacum* L. Sp. Pl. ii, 798 (1753).

Rapid City, altitude 975 m., July 25 (No. 846).

Lactuca ludoviciana (Nutt.) DC. Prodr. vii, 141 (1839); *Sonchus ludovicianus* Nutt. Gen. ii, 125 (1818).

Hillside east of Custer, altitude 1,600 m., July 23 (No. 847).

Lactuca pulchella (Pursh) DC. Prodr. vii, 134 (1839); *Sonchus pulchellus* Pursh, Fl. ii, 502 (1814).

Custer, altitude 1,650 m., August 16; Hot Springs, altitude 1,050 m., August 2 (No. 848).

Sonchus asper (L.) All. Fl. Ped. i, 222 (1785); *Sonchus oleraceus asper* L. Sp. Pl. ii, 794 (1753).

Hot Springs, altitude 1,050 m., August 2 (No. 849).

LOBELIACEÆ.

Lobelia spicata hirtella Gray, Syn. Fl. ii, pt. i, 6 (1878).

Prairie: Custer, altitude 1,600 m., August 1 (No. 850).

CAMPANULACEÆ.

Legouzia perfoliata (L.) Britton, Mem. Torr. Club, v, 309 (1894); *Campanula perfoliata* L. Sp. Pl. i, 169 (1753).

No corolliferous flowers were seen. Whitewood, altitude 1,100 m., July 7; Custer, altitude 1,650 m., July 15 (No. 851).

Campanula rotundifolia L. Sp. Pl. i, 163 (1753).

Hot Springs, altitude 1,100 m., June 17; Hermosa, altitude 1,150 m., June 22; Lead City, altitude 1,700 m., July 4 (No. 852).

Campanula aparinoides Pursh, Fl. i, 159 (1814).

Wet meadows: Custer, altitude 1,600 m., August 19 (No. 853).

ERICACEÆ.

Vaccinium myrtillus microphyllum Hook. Fl. Bor. Amer. ii, 33 (1834).

The plant (without flowers or fruit) was collected on a shaded hillside, near Lead City, altitude 1,600 m., July 6 (No. 854).

Arctostaphylos uva-ursi (L.) Spreng. Syst. ii, 287 (1825); *Arbutus uva-ursi* L. Sp. Pl. i, 395 (1753).

Common throughout the Black Hills and generally called "kinnikinick." In woods: Custer, altitude 1,700 m., June 3 (No. 855).

PYROLACEÆ.

Pyrola secunda L. Sp. Pl. i, 396 (1753).

In woods: Little Elk, altitude 1,100 m., June 27; Lead City, altitude 1,600 m., July 6 (No. 856).

Pyrola chlorantha Swartz, Kongl. Vet. Acad. Handl. ser. 2, xxxi, 194 (1810).

Woods: Little Elk Canyon, altitude 1,100 m., June 27; Custer, altitude 1,600 m., August 19 (No. 857).

Pyrola elliptica Nutt. Gen. i, 273 (1818).

Shaded hillsides: Lead City, altitude 1,600 m., July 6; Custer, altitude 1,600 m., August 19 (No. 858).

Pyrola rotundifolia L. Sp. Pl. i, 396 (1753).

Only one specimen, collected at Lead City, altitude 1,600 m., July 6 (No. 859).

Pyrola rotundifolia bracteata (Nutt.) Gray, Bot. Cal. i, 460 (1876); *Pyrola bracteata* Nutt. Gen. i, 270 (1818).

The large bracts and purplish flowers distinguish this variety, which is reputed to be of a more westerly range. In a cold bog above Sylvan Lake, at an altitude of 2,100 m., July 19 (No. 860).

Pterospora andromedea Nutt. Gen. i, 269 (1818).

In fruit from preceding year: Custer, altitude 1,650 m., June 3; in flower, Sylvan Lake, altitude 1,200 m., August 19 (No. 861).

PRIMULACEÆ.

Dodecatheon pauciflorum (Durand) Greene, Pittonia, ii, 72 (1889); *Dodecatheon meadia pauciflorum* Durand, Pl. Pratt. 95 (1855).

On wooded hillsides: Custer, altitude 1,700 m., May 28 and June 2 (No. 862).

A stouter form, approaching *D. meadia*, was collected at Custer, June 5 (No. 863).

Androsace septentrionalis L. Sp. Pl. i, 142 (1753).

Custer, altitude 1,650 m., June 3; Elk Canyon, altitude 1,200 m., June 29 (No. 864).

Androsace occidentalis Pursh, Fl. i, 137 (1814).

Dry table-land: Hot Springs, altitude 1,100 m., June 13 (No. 865).

Steironema ciliatum (L.) Baudo, Ann. Sci. Nat. ser. 2, xx, 346 (1843); *Lysimachia ciliata* L. Sp. Pl. 147 (1753).

The leaves of the specimens from Custer are scarcely subcordate at the base. Rochford, altitude 1,600 m., July 11; east of Custer, on the French Creek, altitude, 1,500 m., July 22 (No. 866).

Naumburgia thyrsiflora (L.) Duby, in DC. Prodr. viii, 60 (1844); *Lysimachia thyrsiflora* L. Sp. Pl. i, 147 (1753).

Wet places: Elk Canyon, altitude 1,200 m., July 29 (No. 867).

Centunculus minimus L. Sp. Pl. i, 116 (1753).

In Ruby Gulch, northwest of Custer, altitude 1,700 m., August 20 (No. 868).

OLEACEÆ.

Fraxinus pennsylvanica Marsh. Arb. Amer. 51 (1785).

Along Squaw Creek, above Hermosa, altitude 1,050 m., June 22 (No. 869).

Fraxinus pennsylvanica lanceolata (Borck.) Sargent, Silva Amer. vi, 50 (1894); *Fraxinus lanceolata* Borck. Handb. Forstbot. i, 826 (1800).

Together with the preceding (No. 870).

APOCYNACEÆ.

Apocynum androsæmifolium L. Sp. Pl. i, 213 (1753).

Borders of woods: Hermosa, altitude 1,100 m., June 24; Rapid City, altitude 1,000 m., July 25; Little Elk Canyon, altitude 1,100 m., June 27; Lead City, altitude 1,700 m., July 6 (No. 871). Specimens collected in Elk Canyon, altitude 1,200 m., June 29, and at Hot Springs, altitude 1,100 m., August 3, are ambiguous between this species and *A. cannabinum*. The leaves are short-petioled, and the corolla greenish white and smaller than in *A. androsæmifolium*, and the branches upright (No. 872).

ASCLEPIADACEÆ.

Asclepias ovalifolia Dec. in DC. Prodr. viii, 567 (1844).

On French Creek, below Custer, altitude 1,500 m., July 22 (No. 873).

Asclepias verticillata pumila Gray, Proc. Amer. Acad. xii, 71 (1876).

Prairie: Minnekahta, altitude 1,300 m., August 6 (No. 874).

Acerates angustifolia[1] (Nutt.) Dec. in DC. Prodr. viii, 522 (1844); *Polyotus angustifolius* Nutt. Trans. Amer. Phil. Soc. n. ser. v, 20 (1833–1837).

Minnekahta Plains, altitude 1,300 m., August 6 (No. 875).

Acerates viridiflora[2] (Raf.) Eat. Man. ed. 5, 90 (1829); *Asclepias viridiflora* Raf. Med. Rep. xi, 360 (1808).

Only one specimen was collected: Minnekahta Plains, altitude 1,300 m., August 6 (No. 876).

GENTIANACEÆ.

Gentiana acuta Mx. Fl. i, 177 (1803); *Gentiana amarella acuta* Herder, Act. Hort. Petrop. i, 428 (1872).

The specimen appears to be a form of this species modified by the habitat, viz, a heavily shaded hillside. The whole plant is light green, the leaves broad and thin, 3- to 5-ribbed. Young plants can scarcely be distinguished from those of the next. The flowers are greenish yellow, occasionally a little bluish on the limb. South of Custer, altitude 1,700 m., August 15 (No. 877).

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[1] See my remarks on this species, this volume, p. 169.

[2] The binomial is not given by Elliott (Bot. S. Car. & Georg. 317, 1823), but he refers *Asclepias viridiflora* to the genus *Acerates*.

Tetragonanthus deflexus (Smith) Kuntze, Rev. Gen. Pl. ii, 431 (1891); *Swertia deflexa* Smith, Rees's Cycl. no. 8 (1816).

In woods: Deadwood, altitude 1,400 m., July 5; Custer, altitude 1,700 m., August 15 (No. 878).

Frasera speciosa Dougl.; Hook. Fl. Bor. Amer. ii, 66 (1838).

High barren hills: Lead City, altitude 1,700 m., July 2; Limestone District, altitude 1,900 m., July 25 (No. 879).

POLEMONIACEÆ.

Phlox douglasii Hook. Fl. Bor. Amer. ii, 73 (1838).

Common around Hot Springs, altitude 1,100 m., June 15 (No. 881).

On wooded hillsides was found a peculiar Phlox, probably belonging to this species. The plant is prostrate, spreading, slender, with very narrow, subulate, weak, leaves, the corolla scarcely longer than the calyx. Hot Springs, altitude 1,300 m., June 15 (No. 880).

Phlox douglasii andicola (Nutt.) Britton, Mem. Torr. Club, v, 269 (1895); *Phlox andicola* Nutt.; Gray, Proc. Amer. Acad. viii, 254 (1870).

Table-land: Hot Springs, altitude 1,100 m., June 14 (No. 882).

Phlox kelseyi Britton, Bull. Torr. Club, xix, 225 (1892).

All specimens collected differ from the typical *Phlox kelseyi* in having nearly white instead of blue or lilac flowers. Two forms were found. One of them has long leaves 1.5 to 3 cm. long and 2 to 3 mm. wide, and larger flowers on pedicels 1 to 2 cm. long. Hot Springs, altitude 1,100 m., June 13; Sylvan Lake, altitude 2,000 m., July 19 (No. 883). The other is more cespitose, has shorter and broader leaves, 0.5 to 1.5 cm. long and 3 to 4 mm. wide, and the nearly sessile flowers have shorter tubes. This is evidently the same as *P. longifolia brevifolia* Gray,[1] collected by Jenney, although I have not seen that plant. My specimens were collected about 20 miles from Jenneys Stockade, in the Limestone District, near Bull Springs, altitude 1,900 m., July 26. Britton refers Jenney's plant to *Phlox kelseyi*. The original variety *brevifolia*[2] is to be referred to *Phlox stansburyi* (Torr.) Britton. From this *Phlox kelseyi* is easily distinguished by its larger flowers and the very broad, obovate lobes of the corolla (No. 884).

Collomia linearis Nutt. Gen. i, 126 (1818).

Hermosa, altitude 1,100 m., June 23; Rochford, altitude 1,700 m., July 11; Lead City, altitude 1,500 m., July 17. The specimens from the latter place are unusually large and branching, some even 4 to 5 dm. high (No. 885).

Gilia spicata capitata Gray, Proc. Amer. Acad. viii, 274 (1870).

I believe that this is distinct from *G. spicata*. It resembles it in foliage, but the form of the corolla is different. Dry hills or table-lands: Hot Springs, altitude 1,100 m., June 13; Deadwood, altitude 1,500 m., July 5; Bull Springs, altitude 1,900 m., July 25 (No. 886).

HYDROPHYLLACEÆ.

Macrocalyx nyctelea (L.) Kuntze, Rev. Gen. Pl. ii, 434 (1891); *Ipomœa nyctelea* L. Sp. Pl. i, 160 (1753).

Edgemont, altitude 1,050 m., May 27; Rochford, altitude 1,600 m., July 11; Oreville, altitude 1,630 m., July 16 (No. 887).

BORAGINACEÆ.

Lappula virginiana (L.) Greene, Pittonia, ii, 182 (1891); *Myosotis virginica* L. Sp. Pl. i, 131 (1753).

Only one specimen in bloom, found near Lead City, altitude 1,600 m., July 6 (No. 888).

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[1] In Newton & Jenney, Geol. Surv. Black Hills, 535 (1880).

[2] Gray, Syn. Fl. ii, pt. i, 133 (1878).

Lappula deflexa americana (Gray) Greene, Pittonia, ii, 183 (1891); *Echinospermum deflexum americanum* Gray, Proc. Amer. Acad. xvii, 224 (1882).

My specimens belong to a form with short, broad leaves and small flowers. Rare: Lead City, altitude 1,600 m., July 6 (No. 889).

Lappula floribunda (Lehm.) Greene, Pittonia, ii, 182 (1891); *Echinospermum floribundum* Lehm. Pug. ii, 24 (1830).

The common form has distinctly pinnately nerved leaves. Hot Springs, altitude 1,100 m., June 13; Elk Canyon, altitude 1,200 m., June 29; Custer, altitude 1,700 m., July 16 (No. 890).

At Oreville, altitude 1,650 m., July 16, a form was collected which differs, in having much thicker, narrowly lanceolate leaves, with a prominent midrib but obsolete lateral veins (No. 891).

At Rochford, altitude 1,650 m., July 11, a plant was collected, which I also refer here, although it differs considerably from the common form. It was collected in flower only, and as the fruit is necessary for full identification, I leave it with this species. The plant is tall, 1 to 2 m. high, branched from an apparently perennial root, making big, bushy clumps of a dozen stems or more. The upper parts of the plant are yellowish silky, the lower somewhat strigose; the lower leaves spatulate, the upper lanceolate, thickish, with a prominent midrib, the lateral veins obsolete (No. 892).

Lappula redowskii occidentalis (Wats.) Rydberg, Contr. Nat. Herb. iii, 170 (1895); *Echinospermum redowskii occidentale* (Wats.) Bot. King Surv. 246 (1871).

Some of the specimens resemble *L. lappula* in having a larger, more campanulate corolla and being more branched from the base and more leafy. The immature fruit shows characters which place it with *L. redowskii*. Edgemont, altitude 1,050 m., May 27; Hot Springs, altitude 1,100 m., June 15 (No. 576).

The common form was collected at Hot Springs, altitude 1,100 m., June 13; Hermosa, altitude 1,050 m., June 23; Custer, altitude 1,700 m., July 16 (No. 577).

Oreocarya glomerata (Pursh) Greene, Pittonia, i, 58 (1887); *Cynoglossum glomeratum* Pursh, Fl. ii, 729 (1814).

High table-lands and hills: Hot Springs, altitude 1,100 m., June 13; Whitewood, altitude 1,100 m., July 7 (No. 893).

Cryptanthe pattersoni (Gray) Greene, Pittonia, i, 120 (1887); *Krynitzkia pattersoni* Gray, Proc. Amer. Acad. xx, 268 (1885).

The seeds are brown-spotted and less attenuate than in *C. fendleri*, but otherwise as in that species. The leaves are also broader. Lead City, altitude 1,600 m., July 6; Rochford, altitude 1,700 m., July 12 (No. 894).

No. 895 is a small Cryptanthe, perhaps nearly related, but there are no fruits in the collection, hence it can not be determined. It looks very like some specimens in the National Herbarium labeled *Krynitzkia affinis*, but it may be an undeveloped form of nearly any of the related species. Buckhorn Mountain, near Custer, altitude 1,800 m., July 16.

Myosotis verna macrosperma (Engelm.); *Myosotis macrosperma* Engelm. Amer. Journ. Sci. xlvi, 98 (1844).

Rare: Hot Springs, altitude 1,100 m., June 13 (No. 575).

Myosotis sylvatica Hoffmann, Deutsch. Fl. i, 85 (1791).

Slender, 1.5 to 3 dm. high, raceme loose, the pedicels longer than the fruiting calyx. It does not belong to the variety *alpestris*, which has been regarded as the only American form, but rather to the species. High altitudes in damp places among rocks: Sylvan Lake, altitude 2,000 m., July 19 (No. 896).

Mertensia sibirica (L.) Don, Hist. Dichl. Pl. iv, 319 (1838); *Pulmonaria sibirica* L. Sp. Pl. i, 135 (1753).

A single fruiting specimen, which seems to belong to this species, was collected at Rochford, altitude 1,700 m., July 12 (No. 897).

Mertensia paniculata (Ait.) Don, Hist. Dichl. Pl. iv, 318 (1838); *Pulmonaria paniculata* Ait. Hort. Kew. i, 181 (1789).

In the few specimens collected the calyx is not ciliate and the corolla only 6 to 8 mm. long. Rochford, altitude 1,700 m., July 12 (No. 898).

Mertensia lanceolata (Pursh) DC. Prodr. x, 88 (1846); *Pulmonaria lanceolata* Pursh, Fl. ii, 729 (1814).

There seem to be two forms of this species, one with larger flowers, about 1 cm. long, the tube more abruptly widening into the campanulate limb, thicker, somewhat fleshy leaves, and more simple stem. This is the more common form in the Black Hills. Custer, altitude 1,700 m., May 30 (No. 899).

The form growing in western Nebraska with thin leaves of a light-green color, paniculately branched stem, and smaller, more funnelform flowers was found near Sylvan Lake, altitude 2,000 m., July 19 (No. 900).

Lithospermum angustifolium Mx. Fl. i, 130 (1803).

Prairie: Hot Springs, altitude 1,100 m., June 15; Buffalo Gap, altitude 1,100 m., June 21; Custer, altitude 1,650 m., August 1 (No. 901).

Onosmodium molle Mx. Fl. i, 133 (1803).

Prairie: Hot Springs, altitude 1,100 m., June 16 (No. 902).

CONVOLVULACEÆ.

Evolvulus nuttallianus Roem. & Schult. Syst. Veg. vi, 198 (1820); *E. argenteus* Pursh, Fl. i, 187 (1814), not R. Br. Prodr. (1810); *E. pilosus* Nutt. Gen. i, 174 (1818), not Lam.

Rare: collected in fruit only at Hot Springs, altitude 1,100 m., June 13 (No. 903).

Ipomœa leptophylla Torr. in Frem. First Rep. 94 (1843).

Prairie: Hot Springs, altitude 1,100 m., June 15 (No. 578).

Convolvulus sepium L. Sp. Pl. i, 153 (1753).

Rare: Custer, altitude 1,650 m., August 1 (No. 904).

SOLANACEÆ.

Solanum triflorum Nutt. Gen. i, 128 (1818).

On the railroad embankment north of Custer, altitude 1,650 m., July 16 (No. 905).

Solanum nigrum L. Sp. Pl. i, 186 (1753).

Hot Springs, altitude 1,050 m., June 13 (No. 906).

Solanum rostratum Dunal, Hist. Sol. 234 (1813).

Custer, altitude 1,650 m., August 1 (No. 907).

Physalis heterophylla Nees, Linnæa, vi, 463 (1831); *Physalis viscosa* Pursh, Fl. i, 157 (1814), not L.; *Physalis virginiana* Gray, Proc. Amer. Acad. x, 65 (1874), not Mill.

This is an upright form with thinner leaves and scarcely glandular at all. Hills, on French Creek east of Custer, altitude 1,500 m., July 23 (No. 908).

Physalis longifolia Nutt. Trans. Amer. Phil. Soc. ser. 2, v, 193 (1837).

Among bushes: Hot Springs, altitude 1,050 m., June 18 (No. 910).

Physalis virginiana Mill. Gard. Dict. ed. 8, no. 4 (1768); *Physalis lanceolata* Gray, Proc. Amer. Acad. x, 67 (1874), not Mx.

This is the common form of *P. virginiana*. It differs from the type slightly in the leaves, which are less sinuately toothed. The original *P. virginiana*, described and figured by Miller, has deeply toothed leaves and the whole plant is more or less glutinous. It is a very rare form.

The few poor specimens in this collection are more or less pubescent, with sinuately toothed or wavy-margined leaves, yellow fruit, and a pyramidal, angled, fruiting calyx with a sunken base, a character which distinguishes all forms of this species from *P. lanceolata* Mx. Lead City, altitude 1,600 m., July 6 (No. 909).

SCROPHULARIACEÆ.

Verbascum thapsus L. Sp. Pl. i, 177 (1753).

Introduced on the railroad embankment near Fall River Falls, altitude 1,000 m., August 10 (No. 911). Only two plants collected.

Collinsia parviflora Lindl. Bot. Reg. xiii, t. 1082 (1827).

Dry hillsides: Little Elk Canyon, altitude 1,200 m., June 27; Elk Canyon, altitude 1,200 m., June 29 (No. 913).

Linaria canadensis (L.) Dum. Bot. Cult. ii, 96 (1802); *Antirrhinum canadense* L. Sp. Pl. ii, 618 (1753).

Very slender and depauperate, apparently with cleistogamous flowers. The same form has also been collected in Nebraska by Rev. J. M. Bates, of Valentine. Custer, altitude 1,700 m., August 20 (No. 912).

Scrophularia nodosa occidentalis, var. nov.

Tall, 1 to 1.5 m. high, glandular, especially on the upper part of the stem; leaves ovate or slightly heartshaped at the base, doubly and sharply serrate or incised; petioled, with fascicles of smaller leaves in the axils; panicle with short branches; sepals rounded-elliptical, obtuse, slightly margined; corolla lurid-greenish, gibbose at the base; sterile stamens very broad, kidney-shaped on a claw.

It differs from *S. nodosa* proper and *S. nodosa marilandica* in being glandular and in the sharp serration of the leaves; from *S. californica* in its larger flowers, sharper serrations, stout habit, and the form of the sterile stamen; from all three in the more gibbose corolla. No. 997, Suksdorf seems to belong to the same variety. Rapid City, altitude 1,000 m., July 25 (No. 914). Most of the specimens were damaged by rain while in the press.

Pentstemon grandiflorus Nutt. Fraser's Cat. (1813).

Prairies: Hermosa, altitude 1,050 m., June 24 (No. 915).

Pentstemon glaber Pursh, Fl. ii, 738 (1814).

Hills: North of Deadwood, altitude 1,500 m., July 5; Rochford, altitude 1,700 m., July 12; Custer, altitude 1,700 m., July 18 (No. 916).

Pentstemon angustifolius Pursh, Fl. ii, 738 (1814), not Lindl. (1827); *P. cæruleus* Nutt. Gen. ii, 52 (1818).

Only two specimens collected: Hot Springs, altitude 1,100 m., June 15 (No. 917).

Pentstemon jamesii Benth. in DC. Prodr. x, 325 (1846).

My specimens are like Fendler's No. 575. This, with his No. 579 and the original specimens of James, are the only ones cited by Gray in his synopsis of the genus in the Proceedings of the American Academy.[1] I think Watson's No. 778, named *P. cristatus*, should also be referred to this species. Table-land: Hot Springs, altitude 1,100 m., June 16 (No. 918).

Pentstemon erianthera Pursh, Fl. ii, 737 (1814).

P. cristatus Nutt.[2] is a *nomen nudum;* hence *P. erianthera* Pursh, is the oldest name. Only four specimens of this were collected, two in Elk Canyon, altitude 1,200 m., June 29, and two depauperate ones in the Limestone District near Bull Springs, altitude 1,900 m., July 27 (No. 919).

Pentstemon albidus Nutt. Gen. ii, 53 (1818).

Only one specimen, found near Hermosa, altitude 1,100 m., June 23 (No. 920).

Pentstemon gracilis Nutt. Gen. ii, 52 (1818).

Common: Hot Springs, altitude 1,050 m., June 15; Hermosa, altitude 1,000 m., June 22; Elk Canyon, altitude 1,200 m., June 29; Lead City, altitude 1,600 m., July 6; Rochford, altitude 1,700 m., July 11 (No. 921).

Mimulus luteus L. Sp. Pl. ed. 2, ii, 884 (1763).

In a wet, shady place near a stream, southwest of Lead City, altitude 1,700 m., July 9 (No. 922).

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[1] vi, 67 (1866).

[2] Fraser's Cat. (1813).

Mimulus glabratus jamesii (Torr. & Gray) Gray, Syn. Fl. Suppl. 447 (1886); *Mimulus jamesii* Torr. & Gr.; DC. Prodr. x, 371 (1846).

In water: Hot Springs, altitude 1,050 m., June 18; Custer, altitude 1,600 m., August 1; Pringle, altitude 1,500 m., August 5 (No. 923).

Gratiola virginiana L. Sp. Pl. i, 17 (1753).

The corolla in my specimens is fully twice as long as the calyx. In marshy places: Buckhorn Mountain, near Custer, altitude 1,700 m., July 16; west of Custer, altitude 1,700 m., July 25 (No. 924).

Wulfenia rubra (Hook.) Greene, Erythea, ii, 83 (1894); *Gymnandra rubra* Hook. Fl. Bor. Amer. ii, 103 (1838).

Hillsides: Custer, altitude 1,100 m., June 6 (No. 925).

Veronica anagallis L. Sp. Pl. i, 12 (1753).

Rare: Hot Springs, altitude 1,050 m., June 16 (No. 926).

Veronica americana Schwein.; Benth. in DC. Prodr. x, 468 (1846).

Rapid Creek, altitude 1,000 m., June 25; Whitewood, altitude 1,150 m., July 7; Custer, altitude 1,600 m., August 1 (No. 927).

Veronica peregrina L. Sp. Pl. i, 14 (1753).

My specimens are decidedly glandular. Hills: Hermosa, altitude 1,100 m., June 23; Lead City, altitude 1,700 m., July 6 (No. 928).

Castilleja acuminata (Pursh) Spreng. Syst. ii, 775 (1825); *Bartsia acuminata* Pursh, Fl. ii, 429 (1814).

Woods: Little Elk Canyon, altitude 1,100 m., June 27; Elk Canyon, altitude 1,300 m., June 29; Lead City, altitude 1,600 m., July 6 (No. 929).

Castilleja sessiliflora Pursh, Fl. ii, 738 (1814).

Table-land: Hot Springs, altitude 1,100 m., June 15 (No. 930).

Orthocarpus luteus Nutt. Gen. ii, 57 (1818).

Meadow: Custer, altitude 1,600 m., August 1 (No. 931).

VERBENACEÆ.

Verbena stricta Vent. Hort. Cels. t. 53 (1800).

Custer, altitude 1,600 m., August 1; Hot Springs, altitude 1,100 m., August 3 (No. 932).

Verbena hastata L. Sp. Pl. i, 20 (1753).

Rare: Hot Springs, altitude 1,050 m., June 16 (No. 933).

Verbena bracteosa Mx. Fl. ii, 13 (1803).

Lead City, altitude 1,600 m., July 9 (No. 934).

Verbena bipinnatifida Nutt. Journ. Acad. Phila. ii, 123 (1821).

Prairie, 2 miles east of Fall River Falls, altitude 1,000 m., June 18 (No. 935).

OROBANCHACEÆ.

Thalesia fasciculata (Nutt.) Britton, Mem. Torr. Club, v, 298 (1894); *Orobanche fasciculata* Nutt. Gen. ii, 59 (1818).

Rare: Custer, altitude 1,650 m., June 6 (No. 936).

Orobanche ludoviciana Nutt. Gen. ii, 58 (1818).

On the railroad embankment between Hot Springs and Fall River Falls, altitude 1,050 m., August 8 (No. 937).

LABIATÆ.

Mentha canadensis glabrata Benth. Lab. 181 (1833).

Gray, in the Synoptical Flora, cites *M. borealis* Mx. as a synonym, but this plant does not agree with the description of Michaux's species, which perhaps is the typical *M. canadensis* and not the variety.

Hot Springs, altitude 1,050 m., August 3; Custer, altitude 1,650 m., August 20 (No. 938).

Lycopus sinuatus Ell. Bot. S. Car. & Georg. i, 26 (1816).
Wet meadows: Custer, altitude 1,650 m., August 20 (No. 939).

Hedeoma hispida Pursh, Fl. ii, 414 (1814).
Dry places: Rochford, altitude 1,700, July 11; Custer, altitude 1,700 m., August 1; Minnekahta, altitude 1,300 m., August 4 (No. 940).

Hedeoma drummondii Benth. Lab. 368 (1834).
Dry soil: Custer, altitude 1,700 m., July 16; Hot Springs, altitude 1,100 m., August 2 (No. 941).

Salvia lanceolata Willd. Enum. 37 (1809).
The leaves are broadly oblong or spatulate. Custer, altitude 1,700 m., July 16; Hot Springs, altitude 1,100 m., August 2 (No. 942).

Monarda fistulosa mollis (L.) Benth. Lab. 317 (1833); *Monarda mollis* L. Amœn. Acad. iii, 399 (1756).
Hot Springs, altitude 1,100 m., August 2; Custer, altitude 1,650 m., August 15 (No. 943); Rochford, altitude 1,700 m., July 12 (No. 944).

Vleckia anethiodora (Nutt.) Greene, Mem. Torr. Club, v, 282 (1894); *Hyssopus anethiodorus* Nutt. Fraser's Cat. (1813).
Among bushes: Whitewood, altitude 1,100 m., July 7; east of Custer, on the French Creek, altitude 1,600 m., July 22 (No. 945).

Prunella vulgaris L. Sp. Pl. ii, 600 (1753).
In damp woods: Whitewood, altitude 1,150 m., July 7; east of Custer, altitude 1,600 m., July 22 (No. 946).

Dracocephalum parviflorum Nutt. Gen. ii, 35 (1818).
Hills: Elk Canyon, altitude 1,300 m., June 29; Rochford, altitude 1,800 m., July 12 (No. 947).

Scutellaria galericulata L. Sp. Pl. ii, 599 (1753).
In French Creek, near Custer, altitude 1,600 m., July 16 and August 1 (No. 948).

Stachys palustris L. Sp. Pl. ii, 580 (1753).
Two forms were met with, one with short, oblong leaves, smaller and darker flowers, and more hairy stem (No. 949); the other with longer, lanceolate leaves, and larger light-colored flowers (No. 1208). Lead City, altitude 1,700 m., July 7; Custer, altitude 1,700 m., August 20.

Stachys aspera Mx. Fl. ii, 5 (1803).
Custer, altitude 1,700 m., August 20 (No. 950).

PLANTAGINACEÆ.

Plantago major L. Sp. Pl. i, 112 (1753).
Rochford, altitude 1,600 m., July 11; Custer, altitude 1,650 m., August 1 (No. 951).

Plantago purshii Roem. & Schult. Syst. iii, 120 (1818).
Dry plains: Minnekahta, altitude 1,300 m., August 5 (No. 952).

NYCTAGINACEÆ.

Allionia nyctaginea Mx. Fl. i, 100 (1803).
Rare: Hot Springs, altitude 1,050 m., August 2 (No. 953).

Allionia hirsuta Pursh, Fl. ii, 728 (1814).
Two forms were met with, which seem very distinct, but my collection from the Sand Hills of central Nebraska shows that they grade into each other. One has very broad, oblong-lanceolate, or ovate-oblong leaves, the stem hairy throughout. Custer, altitude 1,700 m., August 1 (No. 954). The other has narrow, lanceolate leaves, the stem hairy only at the nodes. Rochford, altitude 1,700 m., July 11; Hot Springs, altitude 1,100 m., August 2 (No. 955).

Allionia albida Walt. Fl. Car. 84 (1788).

There are two forms in the collection, which I refer to this species. The material is too scanty and poor for a satisfactory determination. One form with broadly lanceolate leaves was obtained at Hot Springs, altitude 1,100 m., August 3 (No. 956). The other form, with very narrowly lanceolate or linear leaves, grew on the plains between Custer and Fairburn, altitude 1,400 m., July 23 (No. 957). Both forms differ from *A. hirsuta* in being smooth up to the peduncle, and from *A. linearis* in the leaves, which are undulate and sparingly ciliolate on the margin, and in the peduncles and involucres, which are hispid.

Allionia linearis Pursh, Fl. ii, 728 (1814).

Custer, altitude 1,650 m., August 1; Hot Springs, altitude 1,100 m., August 3 (No. 958).

AMARANTHACEÆ.

Amaranthus blitoides Wats. Proc. Amer. Acad. xii, 273 (1877).

Railroad embankment, Minnekahta, altitude 1,270 m., August 4 (No. 960).

CHENOPODIACEÆ.

Chenopodium hybridum L. Sp. Pl. i, 219 (1753).

One specimen, collected at Hot Springs, altitude 1,050 m., June 17 (No. 961).

Chenopodium album L. Sp. Pl. i, 219 (1753).

Hot Springs, altitude 1,050 m., June 17 (No. 962).

Chenopodium fremonti Wats. Bot. King Surv. 287 (1871).

In damp woods: Sylvan Lake, altitude 1,900 m., July 20 (No. 963).

Chenopodium fremonti incanum Wats. Proc. Amer. Acad. ix, 94 (1874).

Two small specimens collected near Fall River Falls, altitude 1,000 m., June 17 (No. 964).

Chenopodium leptophyllum (Moq.) Nutt.; Moq. in DC. Prodr. xiii, pt. 2, 71 (1849), as synonym; *C. album leptophyllum* Moq. in DC. Prodr. loc. cit.

Hot Springs, altitude 1,100 m., June 17 (No. 965).

Chenopodium capitatum (L.) Wats. Bot. Cal. ii, 48 (1880); *Blitum capitatum* L. Sp. Pl. i, 4 (1753).

Near the railroad, at Rochford, altitude 1,600 m., July 11 (No. 966).

Monolepis nuttalliana (Roem. & Schult.) Greene, Fl. Fran. 168 (1891); *Blitum nuttallianum* Roem. & Schult. Syst. Mant. i, 65 (1822).

The leaves are more or less sinuately lobed, and the stem more upright than in Nebraska specimens. Buffalo Gap, altitude 1,000 m., June 21; Rochford, altitude 1,600 m., July 11 (No. 967).

POLYGONACEÆ.

Eriogonum flavum Nutt. Fraser's Cat. 1813.

Dry hills: Hermosa, altitude 1,100 m., June 23; Lead City, altitude 1,700 m., July 4 (No. 968).

Eriogonum annuum Nutt. Trans. Amer. Phil. Soc. ser. 2, v, 164 (1833–1837).

Hot Springs, altitude 1,100 m., August 3 (No. 969).

Eriogonum pauciflorum Pursh, Fl. ii, 735 (1814).

The specimens agree well with the description of this species, except that the involucre is narrowly turbinate, and the lobes scarcely scarious-margined, and that the scape is more slender and the leaves are nearly glabrous above. Dry hills: Hermosa, altitude 1,100 m., June 23 (No. 970).

Eriogonum multiceps Nees, in Max. Reise N. A. ii, 446 (1841).

Gypsum hills, near Hot Springs, altitude 1,100 m., August 3 (No. 971).

Rumex venosus Pursh, Fl. ii, 733 (1814).
Custer, altitude 1,700 m., June 5; Hermosa, altitude 1,100 m., June 27 (No. 972).

Rumex occidentalis Wats. Proc. Amer. Acad. xii, 253 (1876).
Near water: Buffalo Gap, altitude 975 m., June 21; Custer, altitude 1,600 m., August 1 (No. 973).

Rumex salicifolius Weinm. Fl. iv, 28 (1821).
Rochford, altitude 1,600 m., July 12 (No. 974).

Rumex crispus L. Sp. Pl. i, 335 (1753).
I believe this is a native of the Black Hills as well as of western Nebraska. Lead City, altitude 1,600 m., July 9; Custer, altitude 1,600 m., August 1 (No. 975).

Rumex acetosella L. Sp. Pl. i, 338 (1753).
Introduced: near Whitewood, altitude 1,100 m., July 7 (No. 976).

Polygonum aviculare L. Sp. Pl. i, 362 (1753).
Rochford, altitude 1,600 m., July 11 (No. 977).
No. 978 is a small, undeveloped, erect form which I took to belong to this species. Mr. J. K. Small, who has identified the species of Polygonum, writes: "It might be a form of *aviculare, litorale,* or *ramosissimum.*"

Polygonum litorale Link, Schrad. Journ. Bot. i, 54 (1799).
Common along the railroad above Hot Springs, altitude 1,050 m., August 9 (No. 979). Some specimens are more upright and have broad, elliptical leaves (No. 980).

Polygonum ramosissimum Mx. Fl. i, 237 (1803).
Hot Springs, altitude 1,050 m., August 9 (No. 982).
Some luxuriant specimens, more decumbent and spreading, with thicker leaves, resemble, according to Mr. Small, a form that has been named variety *patulum* by Engelmann in manuscript. Hot Springs, August 9 (No. 981).

Polygonum sawatchense Small, Bull. Torr. Club, xx, 213 (1893).
Mr. Small remarks about this: "Slender form due to the lower altitude than that of the type." Custer, altitude 1,800 m., July 16 (No. 983).

Polygonum douglasii Greene, Bull. Cal. Acad. i, 125 (1885).
Tall, 4 to 7 dm. high, with conspicuous, strongly nerved sheath. Custer, altitude 1,700 m., August 1 (No. 984).

Polygonum lapathifolium L. Sp. Pl. i, 360 (1753).
Hot Springs, altitude 1,050 m., August 9 (No. 985).

Polygonum emersum (Mx.) Britton, Trans. N. Y. Acad. viii, 73 (1889); *Polygonum amphibium emersum* Mx. Fl. i, 240 (1803).
French Creek, east of Custer, altitude 1,400 m., July 22 (No. 986).

Polygonum viviparum L. Sp. Pl. i, 360 (1753).
In wet place, among moss, below Sylvan Lake, altitude 2,000 m., July 19 (No. 987).

Polygonum convolvulus L. Sp. Pl. i, 364 (1753).
Railroad embankment, Hot Springs, altitude 1,050 m., August 9 (No. 988).

ELEAGNACEÆ.

Eleagnus argentea Pursh, Fl. i, 114 (1814).
Hills in the Limestone District, near Bull Springs, altitude 1,900 m., July 27, (No. 989).

Lepargyræa canadensis (L.) Greene, Pittonia, ii, 122 (1890); *Hippophaë canadensis* L. Sp. Pl. ii, 1024 (1753).
Woods: Custer, altitude 1,700 m., May 30; Little Elk, altitude 1,100 m., June 28; Lead City, altitude 1,600 m., July 6 (No. 990).

Lepargyræa argentea (Nutt.) Greene, Pittonia, ii, 122 (1890); *Eleagnus argentea* Nutt. Fraser's Cat. (1813).
A few bushes were seen near Hot Springs, but no specimens were secured.

SANTALACEÆ.

Comandra pallida A. DC. Prodr. xiv, 636 (1857).
Table-land: Hot Springs, altitude 1,100 m., June 19; Hermosa, altitude 1,100 m., June 23 (No. 991).

EUPHORBIACEÆ.

Euphorbia glyptosperma Engelm. Bot. Mex. Bound. 187 (1859).
Sandy soil: Hot Springs, altitude 1,050 m., August 9 (No. 992).

Euphorbia hexagona Nutt.; Spreng. Syst. iii, 791 (1826).
Sand draw: Hot Springs, altitude 1,150 m., August 9 (No. 993).

Euphorbia marginata Pursh, Fl. ii, 607 (1814).
Hot Springs, altitude 1,050 m., August 9 (No. 994).

Euphorbia dentata Mx. Fl. ii, 211 (1803).
A very variable species. In the same spot were found specimens which might be referred to *E. dentata* proper, to variety *rigida*, and to variety *linearis*. Some even approached *E. cuphosperma* Engelm., which seems to me, however, to be a variety of *E. dentata*. In several cases the seeds approach those of *E. cuphosperma*, being more or less ovoid-pyramidal, with a groove on one side. The leaves are from broadly ovate to linear, and from coarsely dentate to nearly entire.
Sandy soil: Hot Springs, altitude 1,050 m., June 19 and August 3 (No. 995).

Euphorbia dictyosperma Fisch. & Mey. Ind. Hort. Petrop. ii, 37 (1835).
Hot Springs with the preceding, June 17 and August 3 (No. 996).

Euphorbia montana robusta Engelm. Bot. Mex. Bound. 192 (1859).
Hillsides: Hot Springs, altitude 1,100 m., June 17 (No. 997).

Croton texensis (Klotzsch) Muell. Arg. in DC. Prodr. xv, pt. 2, 692 (1866); *Hendecandra texensis* Klotzsch, in Erichs. Archiv. i, 252 (1841).
Sandy soil: Hot Springs, altitude 1,050 m., August 9 (No. 998).

URTICACEÆ.

Ulmus americana L. Sp. Pl. i, 226 (1753).
Along Fall River, altitude 1,000 to 1,100 m., rare. August 8 (No. 999).

Celtis occidentalis L. Sp. Pl. ii, 1044 (1753).
Only one shrubby specimen seen, near Hot Springs, altitude 1,060 m., August 8 (No. 1000).

Urtica gracilis Ait. Hort. Kew. iii, 341 (1879).
Not common: Custer, altitude 1,650 m., August 1 (No. 1001).

Parietaria pennsylvanica Muhl.; Willd. Sp. Pl. iv, 955 (1805).
In shady woods, rare: Hot Springs, altitude 1,050 m., June 13 (No. 1002).

Humulus lupulus L. Sp. Pl. ii, 1028 (1753).
Along French Creek, below Custer, rare; altitude 1,500 m., July 22 (No. 1003).

CUPULIFERÆ.

Betula papyrifera Marsh. Arb. Amer. 19 (1785).
Common in the Black Hills proper. Elk Canyon, altitude 1,200 m., June 29 (No. 1004).

Betula occidentalis Hook. Fl. Bor. Amer. ii, 155 [1838].
The common form in the Black Hills is a tree about 10 m. high with leaves about as large as those of the preceding. In bloom: Custer, altitude 1,700 m., June 5; Little Elk Canyon, altitude 1,200 m., June 27 (No. 1005). Another form was found scarcely 4 m. high with smaller, sharply and doubly serrate leaves, more glandular stem, shorter aments with shorter lateral lobes to the bracts. It approaches the next somewhat in habit and general appearance, but evidently belongs to *B. occidentalis*. Near a brook: Oreville, altitude 1,625 m., July 23 (No. 1006).

Betula glandulosa Mx. Fl. Bor. Amer. ii, 180 (1803).
A shrub 1 to 1.5 m. high. Rochford, altitude 1,600 m., July 12 (No. 1007).

Corylus rostrata Ait. Hort. Kew. iii, 364 (1789).
Here and there in the hills, but not common: Elk Canyon, altitude 1,200 m., June 29 (No. 1008).

Ostrya virginiana (Mill.) Willd. Sp. Pl. iv, 469 (1805); *Carpinus virginiana* **Mill.** Dict. ed. 8, no. 4 (1768).
Among the foothills: Rapid City, altitude 1,000 m., June 25 (No. 1009).

Quercus macrocarpa Mx. Hist. Chen. Amer. ii, 2 (1801).
In the foothills. In most places only shrubby, 3 to 6 m. high, knotty. On the upper Squaw Creek, east of Custer, there were good-sized trees. Hermosa, altitude 1,100 m., June 24; Elk Canyon, altitude 1,200 m., June 29 (No. 1010).
At the first place specimens occurred which had more narrowly lobed leaves and a more straight and vigorous growth. Only young trees were seen (No. 1011).

SALICACEÆ.

Salix bebbiana Sargent, Gard. & For. viii, 463 (1895); *Salix rostrata* **Richards.** App. Frankl. Journ. 753 (1823), not Thuil. Fl. Par. 516 (1790), nor Schleich (1807); *S. vagans occidentalis* Anders. Kongl. Akad. Stock. Förh. (1858), not *S. occidentalis* Bosc. in Koch, Sal. Com. 16 (1828).
A shrub 1 to 3 meters high. Custer, altitude 1,700 m., May 30 (No. 1012); June 6 (No. 1013). In fruit and leaf: Elk Canyon, altitude 1,200 m., June 30 (No. 1016); Hermosa, altitude 1,100 m., June 24; Custer, altitude 1,700 m., August 16; Hot Springs, altitude 1,100 m., August 7 (No. 1018). A few specimens with thick leaves as in *S. humilis* and *S. tristis* were collected at Rochford, altitude 1,700 m., July 12. Even these have been referred to *S. rostrata* by Mr. Bebb (No. 1019).

Salix discolor Muhl. Neue Schrift. Gesell. Naturf. Freunde Berlin, iv, 234 (1803).
A shrub 2 to 8 m. high. Custer, altitude, 1,700 m., June 4 (No. 1014).

Salix cordata Muhl. Neue Schrift. Gesell. Naturf. Freunde Berlin, iv, 236 (1803).
Near water: Custer, altitude 1,700 m., June 4 (No. 1015); leaves, Lead City, altitude 1,600 m., July 9 (No. 1017).

Salix fluviatilis Nutt. Sylva, 73 (1842); *S. longifolia* Muhl. Neue Scrift. Gesell. Naturf. Freunde Berlin, iv, 236 (1803), not Lam.
Rochford, altitude 1,650 m., July 11 (No. 1020).

Populus tremuloides Mx. Fl. ii, 243 (1803).
Common in the higher parts of the Black Hills. Custer, altitude 1,700 m., June 4, female flowers (No. 1021).

Populus deltoides Marsh. Arb. Amer. 106 (1785); *P. monilifera* Ait. Hort. Kew. iii, 406 (1809).
Common in the foothills: Hot Springs, altitude 1,100 m., June 17, fruit; August 3, leaves (No. 1022).
One tree, with unusually narrow crown, was found in a canyon east of Hot Springs, August 3. Of this all the leaves were longer than broad, cuneate at the base, with long acumination and with larger teeth than usual (No. 1023).

Populus acuminata Rydberg, Bull. Torr. Club, xx, 50 (1893).
This is the same as No. 372 of my western Nebraska collection, but the leaves are broader and with shorter acumination. Only three trees found, near Hot Springs, altitude 1,100 m., August 3 (No. 1024).

Populus angustifolia James, Long Exped. i, 497 (1823).
Common along Little Elk Creek, altitude 1,100 m., June 28 (No. 1025).

ORCHIDACEÆ.

Corallorhiza corallorhiza (L.) Karst. Deutsch. Fl. 448 (1880–1883); *Ophrys corallorhiza* L. Sp. Pl. ii, 945 (1753).

Little Elk Canyon, altitude 1,100 m., June 27; Lead City, altitude 1,600 m., July 6 (No. 1026).

Corallorhiza multiflora Nutt. Journ. Acad. Phila. iii, 138 (1823).

Elk Canyon, altitude 1,300 m., June 29; Lead City, altitude 1,600 m., July 4; Custer, altitude 1,600 m., July 16; Sylvan Lake, altitude 2,000 m., July 19 (No. 1027).

Habenaria hyperborea (L.) R. Br.; Ait. Hort. Kew. ed. 2, v, 193 (1813); *Orchis hyperborea* L. Mant. 121 (1767).

Wet places: Lead City, altitude 1,600 m., July 6; near Harneys Peak, altitude 2,000 m., July 20 (No. 1028).

Habenaria bracteata (Willd.) R. Br.; Ait. Hort. Kew. ed. 2, v, 192 (1813); *Orchis bracteata* Willd. Sp. Pl. iv, 34 (1805).

Wet places in woods at high altitudes, near Harneys Peak, altitude 2,000 m., July 20 (No. 1029).

Gyrostachys romanzoffiana (Cham.) MacMillan, Metasp. Minn. Val. 171 (1892); *Spiranthes romanzoffiana* Cham. Linnæa, iii, 32 (1828).

Ruby Glen, near Custer, altitude 1,700 m., August 19 (No. 1030).

Peramium repens (L.) Salisb. Trans. Hort. Soc. i, 301 (1812); *Satyrium repens* L. Sp. Pl. ii, 945 (1753).

Only two specimens found: below Sylvan Lake, altitude 1,900 m., July 19 (No. 1031).

Cypripedium parviflorum Salisb. Trans. Linn. Soc. i, 77 (1791).

In woods: Elk Canyon, altitude 1,200 m., June 28 (No. 1032).

IRIDACEÆ.

Iris missouriensis Nutt. Journ. Acad. Phila. vii, 58 (1834).

This is the *I. tolmeiana* Herbert, of Newton and Jenney's Report.

Collected in fruit only: Piedmont, altitude 1,100 m., June 27; Rochford, altitude 1,600 m., July 12; Pringle, altitude 1,500 m., August 5 (No. 1033).

Sisyrinchium bermudiana L. Sp. Pl. ii, 954 (1753).

Among the foothills: Hot Springs, altitude 1,100 m., June 19; Elk Canyon, altitude 1,200 m., June 29 (No. 1034).

LILIACEÆ.

Allium cernuum Roth, in Roem. Arch. Bot. i, pt. 3, 40 (1798).

All specimens of this species, in the National Herbarium, from the Rocky Mountain region have narrow and apparently channeled leaves; those from the eastern United States have broad and flattened leaves. I do not know which form should be regarded as the typical one, as I have not seen the original description. The description and figure in Curtis's Botanical Magazine agree with the specimens of this collection and, as far as I can judge, with all from the Rocky Mountain region. There the leaves are represented as half-round and channeled, not as "sharply keeled" as they are described in Gray's Manual, ed. 6. In mine they are not keeled at all.

Bull Springs, altitude 1,900 m., July 26; Custer, altitude 1,600 m., August 1; Hot Springs, altitude 1,100 m., August 3 (No. 1035).

Allium geyeri Wats. Proc. Amer. Acad. xiv, 227 (1879).

This, as also the next, is described as having crested capsules. The crests are, however, easily overlooked, being 2 small lobes on each valve, near the top. Overlooking these, I named this *A. mutabile* and the next *A. nuttallii*, which they resemble, respectively, in habit.

Bull Springs, altitude 1,900 m., July 26 (No. 1036).

Allium reticulatum Don, Mem. Wern. Soc. vi, 36 (1826–1831).
Edgemont, altitude 1,050 m., June 13 (No. 1037).

Leucocrinum montanum Nutt.; Gray, Ann. Lyc. N. Y. iv, 110 (1837).
Common around Custer, altitude 1,600 to 1,700 m., May 30 (No. 1038).

Polygonatum biflorum commutatum (Roem. & Schult.) Morong, Bull. Torr. Club, xx, 480 (1893); *Convallaria commutata* Roem. & Schult. Syst. vii, 1671 (1830).
Lead City, altitude 1,600 m., July 6 (No. 1039).

Vagnera amplexicaulis (Nutt.) Greene, Man. Bay Reg. 316 (1894); *Smilacina amplexicaulis* Nutt. Journ. Acad. Phila. vii, 58 (1834).
Wooded hillside: Lead City, altitude 1,600 m., July 6 (No. 1040).

Vagnera stellata (L.) Morong, Mem. Torr. Club, v. 114 (1894); *Convallaria stellata* L. Sp. Pl. i, 316 (1753).
Rare: Elk Canyon, altitude 1,200 m., June 29 (No. 1042).
A form with narrower, conduplicate leaves and slightly longer pedicels, corresponding to *Unifolium liliaceum* Greene, was also found. Hot Springs, altitude 1,100 m., June 11 (No. 1041).

Unifolium canadense (Desf.) Greene, Bull. Torr. Club, xv, 287 (1888); *Maianthemum canadensis* Desf. Ann. Mus. Par. ix, 54 (1807).
In shady woods: Little Elk Canyon, altitude 1,100 m., June 27 (No. 1043).

Yucca glauca Nutt. Fraser's Cat. 1813.
Among the foothills, east of Custer, altitude 1,400 m., July 23 (No. 1044).

Lilium umbellatum Pursh, Fl. i, 229 (1814).
In woods: Little Elk Canyon, altitude 1,200 m., June 27 (No. 1045).

Calochortus gunnisoni Wats. Bot. King Surv. 348 (1871).
In all specimens collected by me, the bulb was only a few inches below the surface, and at the time of blooming without a secondary bulb. Hill above Whitewood, altitude 1,200 m., July 7 (No. 1046).

Calochortus nuttallii Torr. & Gr. Pac. R. Rep. ii, pt. 2, 124 (1855).
In this the bulb was deep down, 15 to 25 cm. below the surface, at the time of blooming, often with a secondary small bulb a few cm. above the principal ones. Fall River Falls, altitude 1,000 m., June 19 (No. 1047).

Streptopus amplexifolius (L.) DC. Fl. Fran. iii, 174 (1805); *Uvularia amplexifolia* L. Sp. Pl. i, 304 (1753).
Near water: Sylvan Lake, altitude 1,900 m., July 20 and August 7 (No. 1048).

Disporum trachycarpum (Wats.) Benth. & Hook. Gen. Pl. iii, 832 (1883); *Prosartes trachycarpa* Wats. Bot. King Surv. 344 (1871).
In shady places below Sylvan Lake, altitude 1,900 m., June 8 and August 17 (No. 1049).

Zygadenus elegans Pursh, Fl. i, 241 (1814).
Little Elk River, altitude 1,200 m., June 27; Elk Canyon, altitude 1,300 m., June 29; Bull Springs, altitude 1,900 m., July 26 (No. 1050).

Zygadenus venenosus Wats. Proc. Amer. Acad. xiv, 279 (1879).
This species has been confused with *Z. nuttallii*. Hot Springs, altitude 1,100 m., June 13 (No. 1051).

SMILACACEÆ.

Smilax herbacea L. Sp. Pl. ii, 1030 (1753).
Hot Springs, altitude 1,050 m., June 19 (No. 1052).

COMMELINACEÆ.

Tradescantia virginiana L. Sp. Pl. i, 288 (1753).
Hot Springs, altitude 1,050 m., June 13 (No. 1053).

JUNCACEÆ.

Juncus vaseyi Engelm. Trans. St. Louis Acad. ii, 448 (1866).

In habit very much resembling the next, from which it differs in the longer, narrower capsule and the tailed seeds. It was growing together with the next at Hot Springs, altitude 1,050 m., August 3 (No. 1054).

Juncus tenuis Willd. Sp. Pl. ii, 214 (1799).

Hot Springs, altitude 1,050 m., August 3; Custer, altitude 1,650 m., May 30 (No. 1055).

Juncus bufonius L. Sp. Pl. i, 328 (1753).

Rare: Hermosa, altitude 1,050 m., June 22 (No. 1056).

Juncus longistylis Torr. Bot. Mex. Bound. 223 (1859).

Not common: Lead City, altitude 1,700 m., July 6 (No. 1057).

Juncus xiphioides montanus Engelm. Trans. Acad. St. Louis, ii, 481 (1868).

Rare; wet meadow: Custer, altitude 1,600 m., August 16 (No. 1058).

Juncus nodosus L. Sp. Pl. ed. 2, i, 466 (1762).

Banks of Fall River, near Hot Springs, altitude 1,050 m., August 3 (No. 1060).

Juncus torreyi Coville, Bull. Torr. Club, xxii, 303 (1895); *Juncus nodosus megacephalus* Torr. Fl. N. Y. ii, 326 (1843), not *J. megacephalus* Curtis.

With the preceding (No. 1061).

Juncoides comosum (Meyer) Sheldon, Bull. Geol. Nat. Hist. Surv. Minn. ix, 64 (1894); *Luzula comosa* Meyer, Syn. Luz. 18 (1823).

Rare: Elk Canyon, altitude 1,200 m., June 29 (No. 1062).

ALISMACEÆ.

Sagittaria arifolia (Nutt.) J. G. Smith, Ann. Rep. Mo. Bot. Gard. vi, [reprint 6] (1894).

The akenes are not mature enough for satisfactory identification. Custer, altitude 1,600 m., July 16; Hot Springs, altitude 1,050 m., August 3 (No. 1063).

ZANNICHELLIACEÆ.

Potamogeton pectinatus L. Sp. Pl. i, 127 (1753).

In the warm springs above Hot Springs, altitude 1,050 m., August 3 (No. 1064).

Potamogeton foliosus Raf. Med. Rep. ser. 2, v, 354 (1808).

In the warm springs: Hot Springs, altitude 1,050 m., June 15 (No. 1065).

LEMNACEÆ.

Lemna minor L. Sp. Pl. ii, 970 (1753).

Rapid Creek, altitude 1,000 m., July 25 (No. 1066).

CYPERACEÆ.

Cyperus aristatus Rottb. Desc. & Icon. 23 (1773).

Rare: only a few small specimens collected in Ruby Glen, Custer, altitude 1,700 m., August 19 (No. 1067).

Cyperus acuminatus Torr. & Hook. Ann. Lyc. N. Y. iii, 435 (1836).

Wet meadow: Custer, altitude 1,700 m., July 16 (No. 1068).

Scirpus americanus Pers. Syn. i, 68 (1805).

Very rare; only one poor specimen secured: Elk Canyon, altitude 1,200 m., June 29 (No. 1069).

Scirpus lacustris L. Sp. Pl. i, 48 (1753).

Elk Canyon, altitude 1,200 m., June 29 (No. 1070).

Scirpus atrovirens pallidus Britton, Trans. N. Y. Acad. ix, 14 (1889).

In French Creek, at Custer, altitude 1,600 m., August 1 (No. 1071).

Scirpus cyperinus (L.) Kunth, Enum. ii, 170 (1837); *Eriophorum cyperinum* L. Sp. Pl. ed. 2, i, 77 (1762).

Rare: Custer, altitude 1,600 m., July 16 (No. 1072).

Scirpus pauciflorus Lightf. Fl. Scot. 1078 (1777).

Banks of French Creek, Custer, altitude 1,600 m., July 16 (No. 1073).

Eleocharis palustris (L.) Roem. & Schult. Syst. Veg. ii, 151 (1817); *Scirpus palustris* L. Sp. Pl. i, 47 (1753).

The specimens of the form most common in the Black Hills are slender and resemble variety *glaucescens* in habit, but the tubercle is rhomboidal, constricted below. Lead City, altitude 1,600 m., July 6; Custer, altitude 1,600 m., July 16 (No. 1074).

At Hot Springs, altitude 1,060 m., August 3, specimens were collected which had a taller, flattened culm, 6 to 8 dm. high; finely striate and purplish at the base; spikes large with thick, scarious-margined bracts. No akenes were seen (No. 1075).

Eleocharis acuminata (Muhl.) Nees, Linnæa, ix, 294 (1835); *Scirpus acuminatus* Muhl. Gram. 27 (1817).

Low, about 2 to 2.5 dm. high, slender, flat, resembling *E. tenuis*, but the akenes are those of *E. acuminata*, viz, bluntly triangular, finely muricate, yellowish, with the tubercle small, pyramidal. Hot Springs, altitude 1,050 m., June 6; Hermosa, altitude 1,000 m., June 24 (No. 1076).

Carex straminea crawei[1] Boott, Ill. 121 (1862).

Rare: Hot Springs, altitude 1,050 m., August 3 (No. 1077).

Carex filifolia Nutt. Gen. ii, 204 (1818).

This is regarded as very good for "winter pasture," and very likely has a nutritive value. On a dry table-land: Hot Springs, altitude 1,100 m., June 14 (No. 1078).

Carex pennsylvanica Lam. Encycl. iii, 388 (1789).

A western form with very long leaves (over 1.5 dm. long), was found in the open valleys near Custer, altitude 1,700 m., August 1 (No. 1079).

A low form with short leaves was common in early spring in the same valleys; May 5 (No. 1080).

Carex marcida Boott; Hook. Fl. Bor. Amer. ii, 212 (1839).

Two forms were collected, which Professor Bailey doubtfully refers to this species. They are both too young for identification. One, more tufted and lower, was found in the open valleys near Custer, altitude 1,700 m., June 5 (No. 1081). The other, taller and more simple, was growing in a similar place, June 4 (No. 1084).

Carex richardsonii R. Br.; Richards. App. Frankl. Journ. 751 (1823).

Common throughout the open valleys around Custer, altitude 1,700 m., June 6 (No. 1082).

Carex stenophylla Wahl. Kongl. Sven. Vet. Akad. Handl. ser. 2, xxiv, 142 (1803).

The specimens are too young for identification, but are referred, subject to question, to this species. Open valley around Custer, June 1 (No. 1083).

Carex stricta Lam. Encycl. iii, 387 (1789).

A form of this species, very slender, with long, soft leaves. In a damp, shaded place below Sylvan Lake, altitude 1,900 m., June 9 and July 18 (No. 1085).

Carex siccata Dewey, Amer. Journ. Sci. x, 278 (1826).

Rare: on the railroad embankment in Elk Canyon, altitute 1,200 m., June 29 (No. 1086).

Carex festiva Dewey, Amer. Journ. Sci. xxix, 246 (1835).

Very rare: near Rapid Creek, Rochford, altitude 1,600 m., July 12 (No. 1087).

Carex utriculata Boott, Hook. Fl. Bor. Amer. ii, 221 (1839).

Wet meadow: Custer, altitude 1,650 m., July 16 (No. 1088).

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[1] The Carices of this collection were determined by Prof. L. H. Bailey.

Carex longirostris Torr.; Schwein. Ann. Lyc. N. Y. i, 71 (1824).
In a shady, wet place below Sylvan Lake, altitude 1,900 m., July 19 (No. 1089).

Carex nebraskensis Dewey, Amer. Journ. Sci. ser. 2, xviii, 102 (1854).
Meadow, near Custer, altitude 1,050 m., July 16 (No. 1090).

Carex retrorsa Schwein. Ann. Lyc. N. Y. i, 71 (1824).
Rare: in wet meadow, near Custer, altitude 1,650 m., July 16 (No. 1091).

Carex deweyana Schwein. Ann. Lyc. N. Y. i, 65 (1824).
Rare: together with last, July 16 (No. 1092).

Carex aurea Nutt. Gen. ii, 205 (1818).
Hills near Lead City, altitude 1,600 m., July 6 (No. 1093*a*).

Carex varia Muhl.; Wahl. Kongl. Sven. Vet. Akad. Handl. ser. 2, xxiv, 159 (1803).
Wet places in Elk Canyon, altitude 1,200 m., June 29 (No. 1094).

Carex laxiflora blanda (Dewey) Boott, Ill. 37 (1858); *C. blanda* Dewey, Amer. Journ. Sci. x, 45 (1826).
Sylvan Lake, July 18 (No. 1095).

Carex tribuloides bebbii (Olney) Bailey, Mem. Torr. Club, i, 55 (1889); *C. bebbii* Olney, Exsicc. fasc. 2, no. 12 (1871).
Together with *C. straminea crawei* at Hot Springs, altitude 1,050 m., August 3 (No. 1209*a*).

Carex tenella Schk. Riedgr. 23 (1801).
Rare: together with *C. deweyana* and *C. retrorsa*, below Sylvan Lake, altitude 1,900 m., July 18 (No. 1210*a*).

GRAMINEÆ.

Panicum capillare L. Sp. Pl. i, 58 (1753).
A very small and slender form, the same as No. 1788 of my collection from the Sand Hills of central Nebraska. Hot Springs, altitude 1,050 m., August 9 (No. 1096).

Panicum virgatum L. Sp. Pl. i, 59 (1753).
Hillside, near Fall River Falls, altitude 1,000 m., July 10 (No. 1097).

Panicum scoparium Lam. Encycl. iv, 744 (1797).
Hill, Lead City, altitude 1,700 m., July 9 (No. 1098).

Panicum dichotomum L. Sp. Pl. i, 58 (1753).
A low and hairy form. Bull Springs in the Limestone District, altitude 1,900 m., July 27 (No. 1099).

Panicum depauperatum Muhl. Descr. Gram. 112 (1817).
Dry hills: Lead City, altitude 1,700 m., July 4; Custer, altitude 1,700 m., July 18 (No. 1100).

Panicum crus-galli L. Sp. Pl. i, 56 (1753).
A low and smooth form. Hot Springs, altitude 1,100 m., June 13 (No. 1101).

Setaria viridis (L.) Beauv. Agrost. (1812); *Panicum viride* L. Sp. Pl. ed. 2, i, 83 (1762).
In the specimens collected, the bristles are unusually long and generally purplish. Railroad embankment near Minnekahta, altitude 1,270 m., August 4 (No. 1102).

Spartina cynosuroides (L.) Willd. Enum. 80 (1809); *Dactylis cynosuroides* L. Sp. Pl. i, 71 (1753).
Custer, altitude 1650 m., July 16 (No. 1103).

Beckmannia erucæformis (L.) Host, Gram. Austr. iii, 5, t. 6 (1805); *Phalaris erucæformis* L. Sp. Pl. i, 55 (1753).
In a pond north of Custer, altitude 1,650 m., July 16 (No. 1093*b*).

Andropogon provincialis Lam. Encycl. i, 376 (1783).
A glaucous form approaching *A. hallii*. Minnekahta Plains, altitude 1,300 m., August 5 (No. 1104).

Andropogon scoparius Mx. Fl. i, 57 (1803).

A wholly smooth form, tufted, with flattened sheaths. **Minnekahta Plains, altitude 1,300 m., August 5 (No. 1105).**

Phalaris arundinacea L. Sp. Pl. i, 55 (1753).

In a stream near Buffalo Gap, altitude 975 m., June 21 (No. 1106).

Savastana odorata (L.) Scribner, Mem. Torr. Club, v, 34 (1894); *Holcus odoratus* L. Sp. Pl. ii, 1048 (1753).

Rare: Pringle, altitude 1,500 m., August 5 (No. 1107).

Alopecurus geniculatus fulvus (Smith) Scribn. Mem. Torr. Club, v, 38 (1894); *A. fulvus* Smith, Engl. Bot. t. 1467 (1793).

Common: Elk Canyon, altitude 1,200 m., June 29; Rochford, altitude 1,650 m., July 11; Custer, altitude 1,600 m., July 16 (No. 1108).

Phleum pratense L. Sp. Pl. i, 59 (1753).

Near a brook, south of Lead City, altitude 1,600 m., July 9 (No. 1109).

Stipa spartea Trin. Mem. Acad. St. Petersb. ser. 6, i, 82 (1829).

Hills: Custer, altitude 1,700 m., August 16 (No. 1110).

Stipa comata Trin. & Rupr. Mem. Acad. St. Petersb. ser. 6, v, 75 (1842).

Hills: Custer, altitude 1,700 m., August 16 (No. 1111).

Stipa viridula Trin. Mem. Acad. St. Petersb. ser. 6, ii, 39 (1836).

Hills: Hot Springs, altitude 1,100 m., August 3 (No. 1112).

Stipa richardsonii Link, Hort. Berol. ii, 245 (1833).

This is the true *S. richardsonii* Link, according to Prof. F. Lamson-Scribner, not the plant so named in Gray's Manual, which is a distinct species, *S. macounii* Scribner. As most descriptions refer to this latter, I at first thought that my plant was a new species and described it as follows: Culms tufted from a short rootstock, slender, 6 to 9 dm. high, smooth; root leaves 1.5 to 2.5 dm. long, stiff, involute, from a loose sheath, minutely scabrous; panicle of slender, flexuose capillary branches, 1 to 1.5 dm. long, which are generally in pairs; outer glumes ovate, membranaceous above, hyaline and acute, unequal, both 3-nerved, purplish when young; flowering glumes only 4 mm. long, black when mature, thinly hairy all over; awn 15 to 25 mm. long, bent at the middle, the lower half twisted, slightly hairy. It much resembles *S. avenacea*, but has a grain of only two-thirds the size and an awn scarcely one-half as long.

On wooded hills: Rochford, altitude 1,700 m., July 12; Custer, altitude 1,600 m., August 19 (No. 1113).

Oryzopsis asperifolia Mx. Fl. i, 51 (1803).

Both this and the next are wanting in Coulter's Manual. **Sylvan Lake, altitude 1,800 m., June 8 (No. 1114).**

Oryzopsis juncea (Mx.) B. S. P. Prel. Cat. N. Y. 67 (1888); *Stipa juncea* Mx. Fl. i, 54 (1803).

Together with the preceding (No. 1115).

Oryzopsis micrantha (Trin. & Rupr.) Thurb Proc. Acad. Phila. 1863, 78 (1863); *Urachne micrantha* Trin. & Rupr. Mem. Acad. St. Petersb. ser. 6, v, 16 (1842).

Rare: Elk Canyon, altitude 1,200 m., June 29 (No. 1116).

Oryzopsis cuspidata (Nutt.) Benth; Vasey, Grasses U. S. 23 (1883); *Eriocoma cuspidata* Nutt. Gen. i, 40 (1818); *Oryzopsis membranacea* (Pursh) Vasey, Grasses S. W. pt. 2, t. 10 (1891); *Stipa membranacea* Pursh, Fl. ii, 728 (1814), not L.

In canyons: Hot Springs, altitude 1,100 m., June 13 (No. 1117).

Aristida fasciculata Torr. Ann. Lyc. N. Y. i, 154 (1824).

Custer, altitude 1,700 m., August 16; Hot Springs, altitude 1,100 m., August 3 (No. 1118).

Muhlenbergia racemosa (Mx.) B. S. P. Prel. Cat. N. Y. 67 (1888); *Agrostis racemosa* Mx. Fl. i, 53 (1803).

A tall and leafy form which may perhaps be referred to the variety *ramosa*. Common on French Creek, altitude 1,600 m., July 22 (No. 1120).

A few specimens were collected near Custer, altitude 1,100 m., August 1, which differ in being more slender and in the empty glumes having longer awns (No. 1121).

Sporobolus cryptandrus (Torr.) Gray, Man. 576 (1848); *Agrostis cryptandra* Torr. Ann. Lyc. N. Y. i, 151 (1824).

Table-lands: Hot Springs, altitude 1,100 m., August 10 (No. 1122).

Sporobolus heterolepis Gray, Man. ed. i, 576 (1848); *Vilfa heterolepis* Gray, Ann. Lyc. N. Y. iii, 233 (1835).

Rare: Pringle, altitude 1,500 m., August 5 (No. 1123).

Sporobolus cuspidatus (Torr.) Scribner, Bull. Torr. Club, x, 63 (1882); *Vilfa cuspidata* Torr.; Hook. Fl. Bor. Amer. ii, 238 (1840).

In Gray's list, Newton & Jenney's Report.[1]

Agrostis alba L. Sp. Pl. i, 63 (1753).

In wet meadows below Custer, altitude 1,600 m., August 1 (No. 1124).

Agrostis exarata Trin. Unifl. 207 (1824).

Rare: Hot Springs, altitude 1,050 m., August 10 (No. 1125).

Agrostis hiemalis (Walt.) B. S. P. Cat. Pl. N. Y. 68 (1888); *Cornucopiæ hyemalis* Walt. Fl. Car. 74 (1788), teste Mx.

The specimens have broad, upright leaves. Wet meadow: Custer, altitude 1,600 m., July 16 (No. 1126).

Calamagrostis canadensis Mx. Beauv. Agrost. 15 (1812); *Arundo canadensis* Mx. Fl. i, 73 (1803).

In my specimens the leaves are more or less involute. Along Fall River, Hot Springs, altitude 1,050 m., August 10 (1128).

Calamagrostis canadensis dubia (Scribner) Vasey, Contr. Nat. Herb. iii, 80 (1892); *Deyeuxia dubia* Scribner, Bot. Gaz. xi, 174 (1886).

Wet meadow, below Custer, altitude 1,600 m., August 16 (No. 1127).

Calamagrostis neglecta (Ehrh.) Gaertn. Fl. Wett. i, 94 (1799); *Arundo neglecta* Ehrh. Beitr. vi, 137 (1791).

Rare: Hot Springs, altitude 1,050 m., August 3 (No. 1129).

Calamagrostis sylvatica americana Vasey, Contr. Nat. Herb. iii, 83 (1892).

Very probably this is a distinct species. It differs much from *C. sylvatica* of Europe. Woods: Rochford, altitude 1,650 m., July 11 (No. 1130).

Calamovilfa longifolia (Hook.) Hack. True Grasses, 113 (1890); *Calamagrostis longifolia* Hook. Fl. Bor. Amer. ii, 241 (1840).

Hot Springs, altitude 1,100 m., August 9 (No. 1131).

Avena striata Mx. Fl. i, 73 (1803).

In woods: Elk Canyon, altitude 1,200 m., June 30; Custer, altitude 1,700 m., July 16 (No. 1132).

Danthonia spicata (L.) Beauv.; Roem. & Schult. Syst. Veg. ii, 690 (1817); *Avena spicata* L. Sp. Pl. i, 80 (1753).

In woods, not uncommon: Rochford, altitude 1,700 m., July 12; Custer, altitude 1,650 m., August 16 (No. 1133).

Schedonnardus paniculatus (Nutt.) Trelease; Branner & Coville, Rep. Geol. Surv. Ark. 1888, pt. 4, 236 (1891); *Lepturus paniculatus* Nutt. Gen. i, 81 (1818).

Very rare: Hot Springs, altitude 1,100 m., June 19 (No. 1134).

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[1] Geol. Surv. Black Hills, 537 (1880).

Bouteloua hirsuta Lag. Var. Cienc. y Litter. ii, pt. 4, 141 (1805).

Prairies: Hot Springs, altitude 1,100 m., June 19 (No. 1135).

Bouteloua oligostachya (Nutt.) Torr.: Gray, Man. ed. 2, 553 (1856); *Atheropogon oligostachyus* Nutt. Gen. i, 78 (1818).

Prairies: Hot Springs, altitude 1,100 m., June 19 (No. 1136).

Bouteloua curtipendula (Mx.) Torr. in Emory, Mil. Recon. 153 (1848); *Chloris curtipendula*, Mx. Fl. i, 59 (1803).

Rare: Hot Springs, altitude 1,100 m., June 19 (No. 1137).

Bulbilis dactyloides (Nutt.) Raf.; Kuntze, Rev. Gen. Pl. ii, 763 (1891); *Sesleria dactyloides* Nutt. Gen. i, 65 (1818).

Prairies: Hot Springs, altitude 1,100 m., June 13; on the French Creek, east of Custer, altitude 1,400 m., July 18 (No. 1138).

Kœleria cristata (L.) Pers. Syn. i, 97 (1805); *Aira cristata* L. Sp. Pl. i, 63 (1753).

Common: Hot Springs, altitude 1,100 m., June 18; Elk Canyon, altitude 1,200 m., June 30; Lead City, altitude 1,700 m., July 9; Rochford, altitude 1,700 m., July 12 (No. 1139).

Eatonia pennsylvanica (DC.) Gray, Man. ed. 2, 558 (1856); *Kœleria pennsylvanica* DC. Cat. Hort. Monsp. 117 (1813).

Rare: Hot Springs, altitude 1,050 m., June 15 (No. 1140).

Catabrosa aquatica (L.) Beauv. Agrost. 157 (1812); *Aira aquatica* L. Sp. Pl. i, 64 (1753).

In a swamp near Pringle, altitude 1,500 m., August 5 (No. 1141).

Eragrostis major Host, Gram. Austr. iv, 14 (1809).

Rare: Hot Springs, altitude 1,050 m., August 9 (No. 1142).

Dactylis glomerata L. Sp. Pl. i, 71 (1753).

Rare: Hot Springs, altitude 1,050 m., June 15 (No. 1143).

Poa fendleriana (Steud.) Vasey, Ill. N. A. Grasses, ii, 74 (1893); *Eragrostis fendleriana* Steudel, Syn. Pl. Gram. 278 (1855).

The panicle is more open than usual, and the glumes are very light in color and shining. It was growing in big tufts on the prairies south of Pringle, altitude 1,500 m., August 5 (No. 1144).

A few bunches with broader, flat leaves and greener flowers were found at Hot Springs, altitude 1,100 m., June 13 (No. 1145).

Poa tenuifolia Buckley, Proc. Acad. Phila. 1862, 96 (1862).

Of two forms collected, one is tall, 4 to 5 dm. high, with broader leaves. Elk Canyon, altitude 1,200 m., June 29; Hot Springs, altitude 1,100 m., August 3 (No. 1146). Another form, referred to this species by Professor Scribner, is densely tufted, 1 to 2 dm. high, scabrous; leaves 3 to 7 cm. long, very narrow, soon involute, scabrous; panicle 5 to 7 cm. long, narrow, with short, upright branches. It differs from the typical form in size, in the narrow, scabrous leaves, the smaller and more rounded spikelets, and the broader glumes. Dry soil: Hot Springs, altitude 1,100 m., June 13 (No. 1147).

Poa nevadensis Vasey, Bull. Torr. Club, x, 66 (1883).

On the railroad embankment above Custer, altitude 1,650 m., July 16 (No. 1148).

Together with the more typical form, another was growing that had a very thick and dense panicle 10 to 15 cm. long and over 2 cm. wide, and large 5- to 8- flowered spikelets, about 1 cm. long, on a short pedicel (No. 1149).

Poa annua L. Sp. Pl. i, 68 (1753).

Rare: Elk Canyon, altitude 1,200 m., June 29 (No. 1150).

Poa pseudopratensis[1] Scribner & Rydberg, sp. nov. PL. XX.

Culms erect, 1 to 2 feet high from a creeping rootstock. Sheaths smooth or very

[1] The description of this species is drawn by Prof. F. Lamson-Scribner.

minutely scabrous; ligule scarious, acute, about 2 lines long, decurrent; leaf blade flat, 1 to 3 lines wide, those of the culm 1 to 3 inches long, those of the sterile shoots 6 to 10 inches long, midnerve prominent beneath, smooth on both surfaces except near the rigid acute tips; the distinctly cartilaginous margins scabrous. Panicle 2 to 4 or 5 (usually about 3) inches long, the scabrous branches at first nearly erect, widely spreading in anthesis; spikelets 3- to 5-flowered, 3 to 4 lines long, usually much longer than the rough pedicels; empty glumes nearly equal, 3-nerved, broadly lanceolate, acute with scarious margins and tips, the keel of the larger second glume scabrous near the apex; flowering glumes oblong, obtuse, 5-nerved, with scarious margins, silky-hairy on the nerves to near the middle and pubescent all over on the dorsal surface near the base, minutely scabrous in the upper part; palea as long as the glume, ciliate-scabrous on the keels, villous near the base.

It has been doubtfully referred to *P. pratensis*. From this it differs in its longer and *acute* ligule, its larger spikelets, and its less strongly compressed glumes, which have broader scarious margins and no cobweb at the base. It resembles also, somewhat, *P. alpina*, but differs in its larger size, long, creeping rootstock, long, *acute* ligule, and empty glumes not conspicuously crested on the keel.

Hot Springs, altitude 1,050 m., June 13; Custer, altitude 1,650 m., July 16 (No. 1151). No. 1272 from the Sand Hills of central Nebraska is the same. It has also been collected by John Macoun at Cypress Hills, British America, in August, 1880, and by Mrs. S. B. Walker at Castle Rock, Colo., in 1890.

Poa pratensis L. Sp. Pl. i, 67 (1753).

A variable species, the extreme forms of which seem very different from each other. One form, very low and tufted with very narrow leaves and small spikelets, was found near Lead City, altitude 1,600 m., July 6 (No. 1153). A form 5 to 8 dm. high, with broad and long leaves (15 to 20 cm. long and 6 mm. wide), and very large spikelets was collected at Hot Springs, altitude 1,050 m., June 13 (No. 1156). A similar one, but with narrow panicle as in *P. serotina*, was found in Elk Canyon, altitude 1,200 m., June 30 (No. 1157). These are perhaps distinct from *P. pratensis*.

Poa nemoralis L. Sp. Pl. i, 69 (1753).

Several forms were collected, which have all been referred to this species by Professor Scribner. One is a low plant approaching variety *stricta*, but having a more open panicle. It resembles *P. cæsia* collected by Rusby in Arizona. Hot Springs, altitude 1,050 m., June 14 (No. 1155). A form that by several has been mistaken for *P. serotina* was collected at Lead City, altitude 1,600 m., July 6; Custer, altitude 1,700 m., August 1 (No. 1158). It has stiff leaves and spreading panicle. *P. serotina* of C. C. Parry's collection and perhaps of Watson, King Survey collection, is the same. Another form is like the last, but with smaller and light-colored spikelets and broader, more flaccid leaves. In a wet place: Rapid City, altitude 1,000 m., June 25 (No. 1159). A slender form with spreading panicle, small, light-green spikelets, and longer pedicels was mistaken for *P. alsodes*. Lead City, altitude 1,600 m., July 6 (No. 1160).

Panicularia nervata (Willd.) Kuntze, Rev. Gen. Pl. ii, 783 (1891); *Poa nervata* Willd. Sp. Pl. i, 389 (1798).

In wet meadows: Whitewood, altitude 1,100 m., July 7 (No. 1161).

Panicularia americana (Torr.) MacMillan, Metasp. Minn. Val. 81 (1892); *Poa aquatica americana* Torr. Fl. U. S. i, 108 (1824).

In ponds, above Custer, altitude 1,650 m., July 16 (No. 1163).

Festuca ovina L. Sp. Pl. i, 73 (1753) var.

The specimens are low, with a narrow panicle, and short, narrow leaves. It resembles the variety *pseudo-ovina* Hack. It grows in bunches on dry prairie. Lead City, altitude 1,600 m., July 4 (No. 1164).

POA PSEUDOPRATENSIS Scribner & Rydberg.

Bromus kalmii Gray, Man. ed. i, 600 (1848).

Lead City, altitude 1,600 m., July 4; Rochford, altitude 1,700 m., July 12; Hot Springs, altitude 1,100 m., August 8 (No. 1165).

Bromus ciliatus L. Sp. Pl. i, 76 (1753).

Rare: Rochford, altitude 1,700 m., July 12 (No. 1166).

Bromus pumpellianus Scribner, Bull. Torr. Club, xv, 9 (1888).

Hillsides: Runkels, altitude 1,300 m., June 30; Rochford, altitude 1,700 m., July 12; Custer, altitude 1,700 m., July 16 (No. 1167).

Agropyron repens glaucum (Desf.) Scribner, Mem. Torr. Club, v. 57 (1894); *Triticum glaucum* Desf. Tabl. Bot. Mus. 16 (1804).

Hills below Deadwood, altitude 1,500 m., July 5 (No. 1168).

Agropyron violaceum majus Vasey, Contr. Nat. Herb. i, 280 (1893).

These specimens seem to belong to this variety, which, however, I do not think is a variety of *A. violaceum*. Professor Scribner regards them as a form of *A. repens*, which they resemble very much. I should take them for a form of that species if it were not for the fact that I could not find any creeping rootstock. They were growing in clumps in the manner of *A. tenerum*. Deadwood, altitude 1,500 m., July 5 (No. 1170). A form of the same, with awns over 1 cm. long, was collected at Rochford, altitude 1,700 m., July 12 (No. 1171).

Agropyron tenerum Vasey, Bot. Gaz. x, 258 (1885).

Deadwood, altitude 1,500 m., July 5 (No. 1169).

Agropyron caninum (L.) Roem. & Schult. Syst. Veg. ii, 756 (1817); *Triticum caninum* L. Sp. Pl. i, 86 (1753).

Common: Lead City, altitude 1,600 m., July 6; Custer, altitude 1,700 m., July 16 and August 16; Hot Springs, altitude 1,100 m., August 3 (No. 1172).

Elymus canadensis L. Sp. Pl. i, 83 (1753).

Along Fall River: Hot Springs, altitude 1,050 m., August 9 (No. 1173).

Elymus canadensis glaucifolius (Willd.) Torr. Fl. U. S. i, 137 (1824); *Elymus glaucifolius* Willd. Enum. 131 (1809).

Hot Springs, altitude 1,050 m., August 9 (No. 1174).

Elymus virginicus L. Sp. Pl. i, 84 (1753), var.

This is the same as No. 1553 of my collection from the Sand Hills of central Nebraska. Hot Springs, August 9 (No. 1175).

Elymus striatus Willd. Sp. Pl. i, 470 (1797).

Rare, with the preceding three. Hot Springs, August 9 (No. 1176).

Elymus elymoides (Raf.) Swezey, Cat. Nebr. Pl. 15 (1891); *Sitanion elymoides* Raf. Journ. Phys. lxxxix, 103 (1819).

Rare, on dry prairie: Hot Springs, altitude 1,100 m., June 13 and August 9 (No. 1177.)

Elymus dasystachys Trin.; Ledeb. Fl. Alt. i, 120 (1831).

The specimens in the collection have much shorter spikes and larger and more hairy spikelets than in the Siberian form. Elk Canyon, near Runkels, altitude 1,300 m., June 30 (No. 1178).

Hordeum jubatum L. Sp. Pl. i, 85 (1753).

Custer, altitude 1,650 m., July 16 (No. 1179).

CONIFERÆ.

Juniperus communis sibirica (Burgsd.); *Juniperus sibirica* Burgsd. Anl. Erz. Anpfl. Holzart. ii, 272 (1787); *J. communis alpina* Gaud. Fl. Helv. vi, 301 (1830).

The name of this plant has been changed lately by botanists in this country to *J. nana* Willd.[1] Willdenow cites *J. sibirica* Burgsd. as a synonym. I have not been

[1] Sp. Pl. iv, 854 (1806).

able to see Burgsdorf's original description, but the variety was already known and had been described by Linnæus in the Species Plantarum, and by Pallas in the Flora Rossica, although not named. Taking Willdenow as authority, I adopt the name *sibirica*. Should Willdenow have been mistaken, and Burgsdorf's shrub not have been the same as his (the identity has not been denied), there is one more name older than Willdenow's that has to be taken into consideration, viz, *J. communis montana* Ait.,[1] the identity of which with Linnæus variety is not questionable. As to the relationship to *J. communis*, I am of the opinion that this plant is best considered as a variety of that species, as many intermediate forms are found.

Custer, altitude 1,800 m., June 4 (No. 1180).

Juniperus sabina prostrata (Pers.) Loud. Arbor. Frut. Brit. iv, 2499 (1838); *J. prostrata* Pers. Syn. Pl. ii, 632 (1807).

This name should be used instead of *J. sabina procumbens* Pursh, unless *J. horizontalis* Moench,[2] is the same. I have no means of verifying the identity of the two. The American trailing savin is well distinguished from *J. sabina* of Europe. Koch and Gordon regard it as a distinct species, and to merge it in *J. sabina*, as has been done lately, is unwarranted. On dry foothills: Hermosa, altitude 1,100 m., June 23; Piedmont, altitude 1,100 m., June 27 (No. 1181).

Juniperus virginiana L. Sp. Pl. ii, 1039 (1753).

Very rare in the hills proper; only two shrubs seen, on the Buckhorn Mountain, near Custer, altitude 1,800 m., June 4. More common in the foothills: Hot Springs, altitude 1,100 m., June 15. One shrub at the latter place had both male and female flowers (No. 1182).

Pinus ponderosa scopulorum Engelm. Bot. Cal. ii, 126 (1880).

Common throughout the Black Hills. The Northern Hills were formerly covered with forest, in which this was the predominant species, but a large portion of the tract has been devastated by mining companies and sawmill operators. Hot Springs, altitude 1,100 m., June 17 (No. 1183).

Picea canadensis (Mill.) B. S. P. Cat. Pl. N. Y. 71 (1888); *Abies canadensis* Mill. Gard. Dict. ed. 8, no. 4 (1768).

Not uncommon in the higher hills, especially on the northern sides. Fruit: Rochford, altitude 1,600 m., July 12 (No. 1210*b*).

SELAGINELLACEÆ.

Selaginella rupestris (L.) Spring, in Mart. Fl. Bras. i, pt. 2, 118 (1840); *Lycopodium rupestre* L. Sp. Pl. ii 1101 (1753).

On dry hills; local: Custer, altitude 1,700 m., June 6 (No. 1184).

LYCOPODIACEÆ.

Lycopodium obscurum L. Sp. Pl. ii, 1102 (1753); *L. dendroideum* Mx. Fl. ii, 282 (1803).

Michaux's species seems to be the true *L. obscurum* L.

Elk Canyon, altitude 1,200 m., June 29 (No. 1185).

OPHIOGLOSSACEÆ.

Botrychium matricariæfolium (?) A. Br. in Doell, Rhein. Fl. 24 (1843).

It seems to stand nearest this species, but the sterile frond is sessile. I took it to be a form of *B. boreale* Milde, with the description of which it agrees quite well. It differs, however, from European specimens in the National Herbarium, in the more slender habit, and in the smaller and less crowded divisions of the sterile frond,

[1] Hort. Kew. iii, 414 (1789).

[2] Meth. Pl. Hort. and Ag. Marburg, 699 (1794).

which is ovate-oblong in outline, not broadly triangular-ovate. Only two specimens (15 to 20 cm. high) were collected by me, on a shaded hillside south of Custer, altitude 1,700 m., August 15. A few specimens were also collected by Prof. A. F. Woods and one of the students of the University of Nebraska. The specimens are of a form that seems to be intermediate between *B. lunaria*, *B. boreale*, *B. lanceolatum*, and *B. matricariæfolium*. It may be a new species, but the material is too meager to warrant a publication (No. 1186).

POLYPODIACEÆ.

Polypodium vulgare L. Sp. Pl. ii, 1085 (1753).
Common in crevices of rocks around Custer, altitude 1,700 m., July 18 (No. 1187).

Polypodium vulgare rotundatum Milde, Fil. Eur. & Atlan. 18 (1867).
It differs from the preceding in its short fronds with rounded lobes and its larger, more confluent sori. Wheeler's Expedition, No. 992, and Watson's No. 1357, belong also to this variety, which has not hitherto been reported for America. In crevices: Custer, altitude, 1,700 m., July 16 (No. 1188).

Cheilanthes gracilis (Fee) Mett. Abh. Senck. Nat. Gesell. iii [reprint 36] (1859); *Myriopteris gracilis* Fee, Gen. Fil. 150 (1850-1852).
On exposed rocks: Hot Springs, altitude, 1,100 m., June 14 (No. 1189).

Pellæa atropurpurea (L.) Link, Fil. Hort. Berol. 59 (1841); *Pteris atropurpurea* L. Sp. Pl. ii, 1076 (1753).
Canyon near Hot Springs, altitude 1,100 m., June 14 (No. 1190).

Pellæa breweri Eaton, Proc. Amer. Acad. vi, 555 (1865).
The specimens in this collection have fronds that are decidedly coriaceous, a modification probably due to the exposed locality in which they grew. I took them first to be a depauperate form of *P. atropurpurea*, but the divisions even of the fertile fronds are broadly ovate, the rachis bright brown instead of purplish black and without scales. They are brittle and when old show the depressions that make them look as if articulated, a characteristic of *P. breweri*. The fronds are 0.5 to 1 dm high from a tufted, thick rootstock, once pinnate, of 5 to 9 pinnæ; pinnæ, 1 cm. or more long, oval or ovate, entire, or the lower with a small lobe on the upper side.
In crevices of exposed limestone rocks, generally on the sunniest side: near Bull Springs, altitude 1,900 m., July 27 (No. 1191).

Pteris aquilina L. Sp. Pl. ii, 1075 (1753).
Custer, altitude 1,700 m., August 19 (No. 1192).

Asplenium trichomanes L. Sp. Pl. ii, 1080 (1753).
Crevices of rocks below Sylvan Lake, altitude 1,900 m., August 18 (No. 1193).

Asplenium septentrionale (L.) Hoffm. Deutsch. Fl. ii, 12 (1795); *Acrostichum septentrionale* L. Sp. Pl. ii, 1068 (1753).
Crevices of rocks, especially on the north side of the mountains: Custer, altitude 1,700 m., June 5 and August 16 (No. 1194).

Asplenium filix-fœmina (L.) Bernh. Schrad. Neues Journ. Bot. i, pt. 2, 26 (1806); *Polypodium filix-fœmina* L. Sp. Pl. ii, 1090 (1753).
Common around Sylvan Lake, altitude 2,000 m., July 20 (No. 1195).

Phegopteris dryopteris (L.) Fee, Gen. Fil. 243 (1850–1852); *Polypodium dryopteris* L. Sp. Pl. ii, 1093 (1753).
In dark woods near Custer, altitude 1,700 m., August 19 (No. 1196).

Dryopteris filix-mas (L.) Schott, Gen. Fil. (1831); *Polypodium filix-mas* L. Sp. Pl. ii, 1091 (1753).
Among rocks: Rochford, altitude 1,200 m., July 12; Buckhorn Mountain, near Custer, altitude 1,800 m., July 16 (No. 1197).

Cystopteris fragilis (L.) Bernh. Schrad. Neues Journ. Bot. i, pt. 2, 27 (1806); *Polypodium fragile* L. Sp. Pl. ii, 1091 (1753).

Throughout the Black Hills: Little Elk, altitude 1,100 m., June 27; Lead City, altitude 1,600 m., July 6; Custer, altitude 1,700 m., August 15 (No. 1198).

Woodsia oregana Eaton, Can. Nat. ii, 90 (1865).

Common throughout the Black Hills: Hermosa, altitude 1,100 m., June 23; Elk Canyon, altitude 1,200 m., June 29; Custer, altitude 1,700 m., August 10 (No. 1199).

Woodsia scopulina Eaton, Can. Nat. ii, 90 (1865).

On wooded hillsides south of Custer, altitude 1,700 m., August 10 (No. 1200).

Onoclea sensibilis L. Sp. Pl. ii, 1062 (1753).

In Gray's list, Newton & Jenney's Report.[1] Also collected by Prof. J. A. Williams, near Rapid City.

Onoclea struthiopteris (L.) Hoffm. Deutsch. Fl. ii, 11 (1795); *Osmunda struthiopteris* L. Sp. Pl. 1066 (1753).

In Gray's list only.

EQUISETACEÆ.

Equisetum arvense L. Sp. Pl. ii, 1061 (1753).

Unusually robust specimens, in damp woods below Sylvan Lake, altitude 1,800 m., June 8 (No. 1201).

Equisetum sylvaticum L. Sp. Pl. ii, 1061 (1753).

With the preceding, June 8 (No. 1202).

Equisetum lævigatum A. Br.; Engelm. Amer. Journ. Sci. xlvi, 87 (1844).

The two forms collected in Nebraska were also found here. The more robust with sessile spike, No. 1260 of my Nebraska collection, was collected in Elk Canyon, altitude 1,200 m., June 29 (No. 1203). The other one, of the same form as No. 1283 of the Nebraska collection, was found at Hot Springs, altitude 1,050 m., August 3 (No. 1204).

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[1] Geol. Surv. Black Hills, 537 (1880).

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DIVISION OF BOTANY.

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I. FLORA OF SOUTHWESTERN KANSAS. REPORT ON A COLLECTION OF PLANTS MADE BY C. H. THOMPSON IN 1893.

By A. S. HITCHCOCK.

II. CREPIS OCCIDENTALIS AND ITS ALLIES.

By FREDERICK V. COVILLE.

III. PLANTS FROM THE BIG HORN MOUNTAINS OF WYOMING.

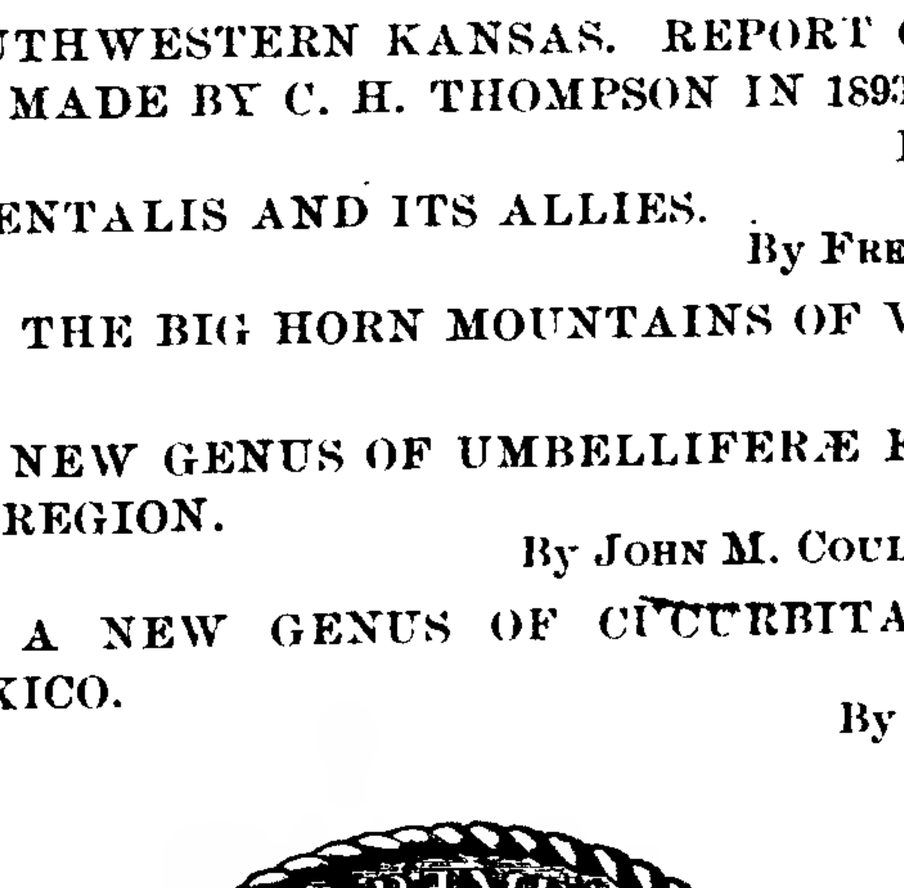
By J. N. ROSE.

IV. LEIBERGIA, A NEW GENUS OF UMBELLIFERÆ FROM THE COLUMBIA RIVER REGION.

By JOHN M. COULTER and J. N. ROSE.

V. ROSEANTHUS, A NEW GENUS OF CUCURBITACEÆ FROM ACAPULCO MEXICO.

By ALFRED COGNIAUX.



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LETTER OF TRANSMITTAL.

U. S. DEPARTMENT OF AGRICULTURE,
DIVISION OF BOTANY,
Washington, D. C., May 18, 1896.

SIR: I have the honor to transmit herewith for publication Contributions from the United States National Herbarium, Volume III, No. 9. This number completes Volume III of this series, and is accompanied by a title page, etc., for the whole volume.

Respectfully,

FREDERICK V. COVILLE,
Botanist.

Hon. J. STERLING MORTON,
Secretary of Agriculture.

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REPORT ON A COLLECTION OF PLANTS MADE BY C. H. THOMPSON IN SOUTHWESTERN KANSAS IN 1893.

By A. S. Hitchcock.

INTRODUCTORY STATEMENT.

The plants of which a catalogue is here presented were collected by Mr. Thompson between June 23 and August 23, 1893, along the following route: Garden City south to Ivanhoe, west to Ulysses and Johnson, north to Syracuse, in various directions over Hamilton County, south along the west line of Stanton County to Richfield, southwest to Point of Rocks on the Cimarron, back to Richfield, east through Moonlight and Hugoton to Liberal, north through Springfield and Santa Fe to Garden City. Collections were made as follows: Ulysses, Grant County, numbers 1 to 66; Johnson, Stanton County, 67 to 73; southern part of Hamilton County, 74 and 75; Syracuse, Hamilton County, 76 to 121, and 123 to 163; Shiloh, Hamilton County, 122; Point of Rocks, Morton County, 164 to 170; Richfield, Morton County, 172 and 173; Moonlight, Stevens County, 174 to 183; Liberal, Seward County, 184; Springfield, Seward County, 185 and 186.

The number of species of plants found upon the high prairie is small under favorable conditions. The season of 1893 was exceptionally dry for this normally dry country, thus placing many difficulties in the way of the collector.

In the summer of 1895 the writer had the pleasure of making a wagon trip through the same counties in which Mr. Thompson collected. The country for the most part consists of nearly level upland prairie, varying in altitude from 2,500 feet at Liberal to 3,500 feet at Syracuse and 3,750 feet at Johnson. The species of plants are few in number and quite widely and evenly distributed. The great bulk of the vegetation consists of buffalo grass (*Bulbilis dactyloides*) and grama grass (*Bouteloua oligostachya*). These grow closely intermingled, forming a dense, soft mat a few inches in height. The latter species shows an interesting adaptation for cross pollination. The flowers are arranged in one-sided spikes, of which there are usually two or three. The two stigmas protrude from the base of the partially opened glumes and recurve toward the main rachis. The anthers, as is usual in grasses,

hang on slender filaments, easily shaken by the slightest breeze. The spikes are so arranged that when acted upon by the wind they turn like vanes. This brings all the spikes in a direction nearly parallel to the wind, the stigmas being to windward and the anthers to leeward: thus the stigmas necessarily receive pollen from a different plant. The same adaptation is seen in other species of Bouteloua and in some other grasses.

The following species are also frequent in the uplands:

Allionia linearis.
Ambrosia psilostachya.
Artemisia wrightii.
Asclepias latifolia.
Carduus ochrocentrus.
Engelmannia pinnatifida.
Eriocarpum spinulosum.
Evolvulus nuttallianus.
Grindelia squarrosa.
Gutierrezia sarothræ.
Hymenopappus tenuifolius.
Ipomœa leptophylla.
Lacinaria punctata.
Lepachys columnaris.
Linum rigidum.
Lygodesmia juncea.
Meriolix serrulata.
Psoralea tenuiflora.
Solidago missouriensis.
Sophora sericea.
Thelesperma gracile.

All these are adapted to the dry climate by possessing the power to retard evaporation from the foliage. Many of them have small or narrow leaves, as in Allionia or Lacinaria, or the leaves are deeply lobed or cut, as in Hymenopappus and Thelesperma, or compound with small leaflets, as in Sophora. In *Ambrosia wrightii* the narrow lobes of the leaves are strongly revolute. The surface is often covered with a hairy coating (Evolvulus, Engelmannia), or is resinous (Gutierrezia, Grindelia). Grindelia, moreover, is strongly paraheliotropic, the sessile leaves twisting near the base and assuming a vertical position. In Linum and especially in Lygodesmia the leaves are reduced, the rod-like stems acting as foliage. *Asclepias latifolia* is the only plant with broad leaves. The leaves, however, are thick, and are either so arranged that they are shaded when on the opposite side from the sun, or set at such an angle as to present the edge to the sun. They are also set close together, so that they protect each other from rapid evaporation. Furthermore, the contiguous lobes at the bases of the leaves, which are opposite and sessile, are upturned, thus forming a depression near the base of each leaf, in which water collects after a rain or a dew at night. This water will remain for many hours and doubtless serves to modify evaporation.

Mr. Thompson collected no Cacti. There are three species common on the uplands: *Opuntia mesacantha*, with pink, pulpy fruit which is eaten by small animals; *O. polyacantha*, with smaller joints and small dry fruit; and *Cereus viridiflorus* Engelm. The two species of Opuntia when found on the uplands almost always have the joints in a vertical position, but appressed to the ground. The tufts of joints are thus not raised much above the buffalo grass. When they occur in the bottom land, as is frequently the case, many of the joints are lifted from the ground and often present the side to the sky. *O. polyacantha*

is usually distinguished by a reddish cast to the spines. *Cereus viridiflorus* is common only in the western half of the territory under consideration.

Many species of plants which may occur scattered here and there in the sod of the upland show a preference for broken prairie, such as fire guards, roadsides, and piles of earth thrown up by prairie dogs and other animals. From this disposition quickly to occupy bare soil they become in some cases troublesome weeds. The following are of this kind:

Aristida fasciculata.
Chamæsaracha coniodes.
Chloris verticillata.
Cladothrix lanuginosa.
Dysodia papposa.
Elymus elymoides.
Erysimum asperum.
Euphorbia glyptosperma.
Euphorbia marginata.
Euphorbia stictospora.
Gaura coccinea.
Helianthus annuus.
Lappula texana.
Malvastrum coccineum.
Martynia louisiana.
Munroa squarrosa.
Panicum capillare.
Physalis lobata.
Salvia lanceolata.
Schedonnardus paniculatus.
Solanum rostratum.

In Schedonnardus, Chloris, and Panicum the whole inflorescence breaks away at maturity and "tumbles" before the wind. The first-mentioned grass is peculiar in the remarkable growth which takes place in the axes after flowering. The main axis may grow to a length of 2 feet or more, becoming at the same time loosely spiral. In Elymus the spike separates and becomes light from the spreading of the long awns. Bushels of these spikes will collect in favorable situations. Aristida, or "spear-grass," becomes in fruit very troublesome. Each fruit separates from the mother plant, the three awns reflex horizontally, and the wind carries them with the barbed callus forward ready to catch in the hair of animals or in clothing. Its abundance in certain localities makes it a great pest.

On the prairie of the valleys the common plants are—

Andropogon hallii.
Andropogon nutans avenaceus.
Andropogon saccharoides glaucus.
Argemone alba.
Astragalus mollisimus.
Elymus canadensis.
Lepachys tagetes.
Sporobolus airoides, or "bunch grass."

Astragalus mollissimus is the common "loco-weed" of this region. In dry years the bunches are conspicuous from their bright green color when the surrounding vegetation is brown. The name *loco* is applied to a number of species of Astragalus and also to *Spiesia lambertii*.

The above plants grow in what is usually called the "second bottom." Still lower, in the first bottom, and where subject to overflow, are found—

Acuan illinoensis.
Baccharis salicina.
Cleome serrulata.
Euphorbia serpens.
Glycyrrhiza lepidota.
Grindelia grandiflora.
Heterotheca subaxillaris.
Rhus radicans.
Spartina cynosuroides.

If the soil is sandy, *Aster tanacetifolius* and *Gaillardia pulchella* are common.

The Grindelia is considered by many to be a variety of *G. squarrosa*. As seen in the field it certainly seems a good species. It is a simple-stemmed annual, often 4 feet or more high, with larger, spinulose-margined leaves and larger heads of flowers which bloom earlier than *G. squarrosa*.

On the upland there are numerous depressions known as "buffalo wallows." These vary from a few feet in diameter to many acres in extent. They retain water some time after a rain and are therefore likely to present an interesting flora. Of Mr. Thompson's collection the following occur in such localities:

Lippia cuneifolia.
Megapterium canescens.
Panicum crus-galli.

The Panicum is erect, a foot or two high, with a contracted inflorescence resembling that of *P. colonum*, and with scarcely awned flowers.

Where the soil becomes salty or alkaline one finds *Agropyron repens glaucum*, *Atriplex expansa*, and *Distichlis spicata*. The Atriplex is a common weed in the Arkansas Valley.

The stony hills occurring along the streams furnish a characteristic flora. Here are found—

Aster ericæfolius.
Atriplex canescens.
Bouteloua hirsuta.
Cæsalpinia jamesii.
Crassina grandiflora.
Eriogonum lachnogynum.
Euphorbia fendleri.
Euphorbia lata.
Euphorbia petaloidea.
Galpinsia hartwegii.
Melampodium cinereum.
Mentzelia decapetala.
Paronychia jamesii.
Parosela enneandra.
Ptilepida acaulis.
Ptilepida scaposa.
Rhus trilobata.
Yucca glauca.

The Mentzelia is a particularly gorgeous plant. Its numerous yellowish-white flowers, 3 or 4 inches in diameter, open toward evening. I observed the flowers of Galpinsia to be visited at dusk by a sphinx moth (apparently *Deilephila lineata*).

Along the Arkansas River, on the south side, lies an extensive range of sand hills. A similar tract is found along the Cimarron River. These regions yield a greater variety of interesting plants than any of the others. Mr. Thompson's collection shows the following:

Abronia fragrans.
Asclepias arenaria.
Calamovilfa longifolia.
Cenchrus tribuloides.
Commelina virginica.
Cristatella erosa.
Croton texensis.
Cycloloma atriplicifolium.
Cyperus schweinitzii.
Eragrostis oxylepis.
Eriogonum annuum.
Eriogonum longifolium.
Euphorbia geyeri.
Fralichia floridana.
Gilia aggregata.
Heliotropium convolvulaceum.
Hymenopappus flavescens.
Mentzelia multiflora.
Parosela aurea.
Parosela lanata.
Pentstemon albidus.
Polanisia trachysperma.
Polypteris hookeriana.
Sporobolus cryptandrus.

Many of these are annuals provided with long taproots. Others are deep-rooted perennials. *Asclepias arenaria* is furnished with a long and slender upright rootstock proceeding from a fleshy vertical root. A specimen dug up by myself showed a rootstock about 5 feet in length, with the diameter of a lead pencil. At the base of this was a fleshy root 1 inch in diameter and 6 inches in length, but cut off at the lower end by the spade.

Mr. Thompson did not collect the cryptogams. Of ferns I observed none. One species of Equisetum is found along the streams, and *Marsilia vestita* is common in the buffalo wallows.

Fairy rings were frequent this season on the uplands. They vary from a few feet to many rods in diameter. Some were formed by a species of large Agaricus, apparently *A. morgani*, but most were due to a large puffball (*Lycoperdon cyathiforme*). These occurred in large numbers and made nearly perfect circles.

In the following list of the species collected by Mr. Thompson the remarks following the designation of locality are taken from the collector's notebook.

CATALOGUE OF SPECIES.

RANUNCULACEÆ.

Cyrtorhyncha cymbalaria (Pursh) Britton, Mem. Torr. Club, v, 161 (1894); *Ranunculus cymbalaria* Pursh, Fl. ii, 392 (1814). Originally found "in saline marshes near the salt works of Onondaga, New York."

Syracuse, Hamilton County (No. 108). Collier's ranch, 7 miles above town, on the Arkansas River; very common.

PAPAVERACEÆ.

Argemone alba Lestib. Bot. Belg. ed. 2, iii, 133 (1799); *A. albiflora* Hornem. Hort. Hafn. 489 (1813–15).

Syracuse, Hamilton County (No. 144). Common.

BRASSICACEÆ.

Erysimum asperum (Nutt.) DC. Syst. ii, 505 (1821); *Cheiranthus asper* Nutt. Gen. ii, 69 (1818); *Erysimum lanceolatum* Pursh, Fl. ii, 436 (1814), not R. Br. Type distribution, "On the plains of the Missouri, commencing near the confluence of White River." Pursh's plant was collected "on the banks of the Missouri."

Shiloh, Hamilton County (No. 122). Frequent on upland prairie.

CAPPARIDACEÆ.

Cleome serrulata Pursh, Fl. ii, 441 (1814). Type found "on the banks of the Missouri."

Springfield, Seward County (No. 185). Common.

Cristatella erosa Nutt. Journ. Acad. Phila. vii, 86 (1834); *Cleome*, n. sp. Torr. Ann. Lyc. N. Y. ii, 168 (1827). "This plant was also found by Mr. Nuttall in the Arkansas Territory in 1819." This is No. 25 of Torrey's list of James's plants. The type data given in Torrey and Gray[1] are "In sand, Arkansas, Dr. James. Texas, Drummond."

Syracuse, Hamilton County (No. 93). Rather common on the sand hills.

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[1] Torr. & Gr. Fl. i, 124 (1838), under *C. jamesii*.

Polanisia trachysperma Torr. and Gr. Fl. i, 669 (1840). Type locality, "Texas."

Syracuse, Hamilton County (No. 121). Common in sandy soil, especially dry creek beds and sand bars.

VIOLACEÆ.

Calceolaria verticillata (Ort.) Kuntze, Rev. Gen. Pl. i, 41 (1891); *Viola verticillata* Ort. Dec. iv, 50 (1797). Type locality, "Nova Hispania."

Richfield, Morton County (No. 171). Frequent in "buffalo wallows;" confined to the high prairie.

POLYGALACEÆ.

Krameria secundiflora DC. Prodr. i, 341 (1824). Type collected "in Mexico."

Richfield, Morton County (No. 170). Sandy slopes under Point of Rocks; rare.

CARYOPHYLLACEÆ.

Paronychia jamesii Torr. & Gr. Fl. i, 170 (1838); *P. dichotoma* Torr. Ann. Lyc. N. Y. ii, 206 (1827), not Nutt. Type collected "on the Arkansa?"

Ulysses, Grant County (No. 19). Valley of a tributary to North Fork Cimarron; rare. Richfield, Morton County. Numbers of this and No. 17 apparently interchanged in the specimens from Richfield.

PORTULACACEÆ.

Portulaca oleracea L. Sp. Pl. i, 445 (1753). Type distribution, "In Europa australi, India, Ins. Ascensionis, America."

Syracuse, Hamilton County (No. 151). Common along railway embankments.

MALVACEÆ.

Callirhoe involucrata (Nutt.) Gray, Pl. Fendl. 15 (1849); *Nuttallia involucrata* Nutt.; Torr. Ann. Lyc. N. Y. ii, 172 (1826–28), *nomen nudum*. Type locality, "Valley of the Loup Fork."

Ulysses, Grant County (No. 46). In grassy meadow of North Fork Cimarron Valley; rare.

Malvastrum coccineum (Pursh) Gray, Pl. Fendl. 21 (1849); *Malva coccinea* Nutt. Fraser's Cat. (1813), *nomen seminudum*; *Cristaria coccinea* Pursh, Fl. ii, 453 (1814). Type distribution, "On the dry prairies and extensive plains of the Missouri."

Ulysses, Grant County (No. 12). Abundant.

LINACEÆ.

Linum rigidum Pursh, Fl. i, 210 (1814). The type was collected "on the Missouri."

Syracuse, Hamilton County (No. 81). Common on irrigated land and along irrigating ditches.

ZYGOPHYLLACEÆ.

Tribulus maximus L. Sp. Pl. i, 386 (1753). Type collected "in Jamaicæ aridis."

Syracuse, Hamilton County (No. 89). Common along the railroad and the Arkansas River.

VITACEÆ.

Parthenocissus vitacea (Knerr) Hitchcock, Spring Fl. Manh. 26 (1894); *Ampelopsis quinquefolia vitacea* Knerr, Bot. Gaz. xviii, 71 (1893). Type locality not given.

Syracuse, Hamilton County (No. 111). Common in timber.

ANACARDIACEÆ.

Rhus trilobata Nutt.; Torr. & Gr. Fl. i, 219 (1838). Originally collected "in the central chain of the Rocky Mountains."

Syracuse, Hamilton County (No. 120). North slopes of sand hills; abundant.

Rhus radicans L. Sp. Pl. i, 266 (1753). The type was found "in Virginia, Canada."

Syracuse, Hamilton County (No. 102). North slopes of sand hills; common.

FABACEÆ.

Psoralea tenuiflora Pursh, Fl. ii, 475 (1814). The type was obtained "on the banks of the Missouri."

Syracuse, Hamilton County (No. 149). Common in lowlands and meadows.

Amorpha fruticosa L. Sp. Pl. ii, 713 (1753). Type collected "in Carolina."

Syracuse, Hamilton County (No. 112). Frequent along river banks.

Parosela aurea (Nutt.) Britton, Mem. Torr. Club, v, 196 (1894); *Dalea aurea* Nutt.; Pursh, Fl. ii, 740 (1818). Type collected "in Upper Louisiana."

Ulysses, Grant County (No. 27). Frequent on sandy land.

Parosela enneandra (Nutt.) Britton, Mem. Torr. Club, v, 196 (1894); *Dalea enneandra* Nutt. Fraser's Cat. no. 30 (1813). Type distribution, "Upper Louisiana and principally in the River Missourie."

Ulysses, Grant County (No. 38). Syracuse, Hamilton County (No. 191). Abundant on uplands and hillsides.

Parosela lanata (Spreng.) Britton, Mem. Torr. Club, v, 196 (1894); *Dalea lanata* Spreng. Syst. iii, 327 (1826). Type obtained "ad fl. Arkansa Amer. bor."

Syracuse, Hamilton County (No. 103). Abundant on otherwise entirely barren sand drifts and blows in the sand hills.

Kuhnistera compacta (Spreng.) Kuntze, Rev. Gen. Pl. i, 192 (1891); *Dalea compacta* Spreng. Syst. Veg. iii, 327 (1826). Type locality, "Ad fl. Rio Roxo in ditione Arkansa Amer. bor."

Ulysses, Grant County (No. 26). On sandy knolls along the South Fork of the Cimarron; rare.

Kuhnistera multiflora (Nutt.) Heller, Mem. Torr. Club, v, 197 (1894); *Petalostemon multiflorus* Nutt. Journ. Acad. Phila. vii, 92 (1834).

Ulysses, Grant County (No. 40). Rare; on hillsides.

Kuhnistera purpurea (Vent.) MacMillan, Metasp. Minn. Val. 329 (1892); *Dalea purpurea* Vent. Jard. Cels, t. 40 (1800). Type locality, "le pays des Illinois."

Ulysses, Grant County (No. 9). On hillsides along the North Fork of the Cimarron and its tributary; very scarce.

Kuhnistera villosa (Nutt.) Kuntze, Rev. Gen. Pl. i, 192 (1891); *Petalostemon villosus* Nutt. Gen. ii, 85 (1818). The type grew "on sandy banks of Knife River, near Fort Mandan, Missouri."

Syracuse, Hamilton County (No. 96). Plentiful in the sand hills.

Astragalus mollissimus Torr. Ann. Lyc. N. Y. ii, 178 (1826). Type collected "on the Platte."

Ulysses, Grant County (No. 3). Abundant, especially on the uplands.

Astragalus scobinatulus Sheldon, Bull. Geol. and Nat. Hist. Surv. Minn. ix, 24 (1894); *A. haydenianus major* Jones, Zoe, ii, 241 (1891). Range of former, "Kansas to Utah;" type of latter collected "at Johnson, Southern Utah, on alkaline flats, or meadows."

Syracuse, Hamilton County (No. 139). Abundant.

Phaca pectinata Hook. Fl. Bor. Amer. i, 141 (1833). Type distribution, "Pastures of the Saskatchawan, *Drummond;* and on the Red Deer and Eagle Hills, bordering on that river. *Douglas.*"

No data accompany these specimens (No. 193).

Glycyrrhiza lepidota Pursh, Fl. ii, 480 (1814). Type collected "on the banks of the Missouri."

Ulysses, Grant County (No. 37). Frequent in the valleys.

Sophora sericea Nutt. Gen. i, 280 (1818). Type collected "on the elevated plains of the Missouri, near the confluence of the White River." Mr. Nuttall remarks in his description: "This is *Astragalus carnosus* of Mr. Pursh, Fl. 2, p. 740. Supplement; he having by mistake applied the description of the fruit of an Astragalus which I had published to this species of Sophora." Pursh's plant was collected "in upper Louisiana."

Syracuse, Hamilton County (No. 87). Common in the Arkansas Valley.

Cæsalpinia jamesii (Torr. & Gr.) Fisher, Bot. Gaz. xviii, 123 (1893); *Hoffmanseggia jamesii* Torr. & Gr. Fl. i, 393 (1840). Type locality, "Sources of Canadian River."

Ulysses, Grant County (No. 5). Also Johnson, Stanton County, and Syracuse, Hamilton County. On upland prairie and more frequently on old plowed land that has been undisturbed for a year or two.

Acuan illinoensis (Mx.) Kuntze, Rev. Gen. Pl. i, 158 (1891); *Mimosa illinoensis* Mx. Fl. ii, 254 (1803). Type distribution, "In pratensibus regionis Illinoensis."

Syracuse, Hamilton County (No. 155). Frequent along dry sloughs in the Arkansas Valley.

LYTHRACEÆ.

Lythrum alatum Pursh, Fl. i, 334 (1814). Type collected "in lower Georgia."

Ulysses, Grant County (No. 34). In creek bottom lands; very rare. The specimens are peculiar in showing many short stems from a strong caudex, probably a result of being annually burned off. The leaves approach closely No. 248 of Lindheimer's Texas plants. Kansas specimens of *L. alatum* show great variation in the leaves and the prominence of the disk.

ONAGRACEÆ.

Onagra biennis (L.) Scop. Fl. Carn. ed. 2, i, 269 (1772); *Œnothera biennis* L. Sp. Pl. i, 346 (1753). Type said to grow "in Virginia unde 1614, nunc vulgaris Europæ."

Syracuse, Hamilton County (No. 163). On canal banks; rare.

Megapterium canescens (Torr. & Frem.) Britton, Mem. Torr. Club, v, 235 (1894); *Œnothera canescens* Torr. & Frem. in Frem. Rep. 315 (1845). The authors make the statement: "This species was collected (we believe) on the upper waters of the Platte."

Syracuse, Hamilton County (No. 143). Only in "buffalo wallows;" common.

Galpinsia hartwegii (Benth.) Britton, Mem. Torr. Club, V, 236 (1894); *Œnothera hartwegii*, Benth. Pl. Hartw. 5 (1839). Type locality, Mexican. Syracuse, Hamilton County (No. 106). Hillsides; not uncommon.

Meriolix serrulata (Nutt.) Walp. Repert. ii, 79 (1843); *Œnothera serrulata* Nutt. Gen. i, 246 (1818). Type distribution, "From the River Platte to the mountains, on dry hills."

Ulysses, Grant County (No. 1). Common on upland prairies, especially in "buffalo wallows."

Gaura coccinea Pursh, Fl. ii, 733 (1814). Type collected "in upper Louisiana."

Johnson, Stanton County (No. 70). Common.

Gaura parviflora Dougl.; Hook. Fl. Bor. Amer. i, 208 (1833). Type locality, "Sandy banks of the Wallawallah River, northwest coast of America."

Syracuse, Hamilton County (No. 133). Occasionally found along ditch banks.

LOASACEÆ.

Mentzelia multiflora (Nutt.) Gray, Pl. Fendl. 48 (1849); *Bartonia multiflora* Nutt. Proc. Acad. Phila. iv, 23 (1847). Type locality, "Sandy hills along the borders of the Rio del Norte, Santa Fe (Mexico.)"

Hamilton County, Millsap's Farm, 16 miles south of Syracuse (No. 74). Frequent in cultivated land and in sedimentary deposits in the low land.

Mentzelia nuda (Pursh) Torr. and Gr. Fl. i, 535 (1840); *Bartonia nuda* Pursh, Fl. i, 328 (1814). Originally collected "on the banks of the Missouri."

Syracuse, Hamilton County (No. 123). Common along ditches.

CUCURBITACEÆ.

Cucurbita fœtidissima H. B. K. Nov. Gen. & Sp. ii, 123 (1817). The type grew "prope Guanaxuato Mexicanorum, allit. 1080 hexap."

Ulysses, Grant County (No. 45). Not uncommon.

CAPRIFOLIACEÆ.

Symphoricarpos occidentalis Hook. Fl. Bor. Amer. i, 285 (1833); *Symphoria occidentalis* R. Br. in Richards. App. Frankl. Journ. 733 (1823), nomen nudum. Type distribution, "British America in the wooded country from latitudes 54° to 64° north."

Syracuse, Hamilton County (No. 100). Bottom land near Arkansas River; frequent.

CARDUACEÆ.

Vernonia baldwinii (Torr.) Ann. Lyc. N. Y. ii, 211 (1827). Type plants found "on the Missouri above St. Louis, and on the lower part of the Ohio. Dr. Baldwin."

Syracuse, Hamilton County (No. 161). Abundant in timbered lowlands.

Vernonia marginata (Torr.) Britton, Mem. Torr. Club, v, 311 (1894); *Vernonia altissima? marginata* Torr. Ann. Lyc. N. Y. ii, 210 (1827). Originally obtained "on the Arkansa?"

Richfield, Morton County (No. 173). By a pond in North Fork Cimarron; rare.

Lacinaria punctata (Hook.) Kuntze, Rev. Gen. Pl. i, 349 (1891); *Liatris punctata* Hook. Fl. Bor. Amer. i, 306 (1833). Type distribution, "Plains of the Saskatchawan, *Drummond;* and on the Red Deer and Eagle hills, in dry soils, common. *Douglas.*"

Moonlight, Stevens County (No. 174). Common on the prairie.

Gutierrezia sarothræ (Pursh) Britton & Rusby, Trans. N. Y. Acad. Sci. vii, 10 (1887); *Solidago sarothræ* Pursh, Fl. ii, 540 (1814). Type collected "on the plains of the Missouri."

Richfield, Morton County (No. 168). Abundant on the higher land.

Grindelia squarrosa (Pursh) Dunal, in DC. Prodr. v, 315 (1836); *Donia squarrosa* Pursh, Fl. ii, 559 (1814). The type was found "in open prairies, on the banks of the Missouri."

Springfield, Seward County (No. 186). Very common.

Chrysopsis villosa hispida (Hook.) Gray, Syn. Fl. i, pt. ii, 123 (1884); Gray, Proc. Acad. Phila. 1863, 65 (1863); *Diplopappus hispidus* Hook. Fl. Bor. Amer. ii, 22 (1834). Type locality, "Carleton House Fort. *Dr. Richardson.*"

Ulysses, Grant County (No. 7). Frequent on hillsides.

Eriocarpum spinulosum (Pursh) Greene, Erythea, ii, 108 (1894); *Amellus spinulosus* Pursh, Fl. 564 (1814). The type was found "in open prairies, on the Missouri."

Ulysses, Grant County (No. 6); abundant. Syracuse, Hamilton County (No. 192).

Solidago missouriensis Nutt. Journ. Acad. Phila. vii, 32 (1834). Type distribution, "On the upper branches of the Missouri and in Arkansas."

Moonlight, Stevens County (No. 175). Common in sandy land.

Aster ericæfolius Rothrock, Bot. Gaz. ii, 70 (1877); *Inula? ericoides* Torr. Ann. Lyc. N. Y. ii, 219 (1827). Type collected "on the Canadian?"

Ulysses, Grant County (No. 65). Not common.

Aster tanacetifolius H. B. K. Nov. Gen. & Sp. iv, 95 (1820). Type locality, "In Norto Mexicano."

Ulysses, Grant County (No. 47). Lowlands; rare.

Erigeron divergens Torr. & Gr. Fl. ii, 175 (1841); *Erigeron divaricatum* Nutt. Trans. Amer. Phil. Soc. n. ser. vii, 311 (1841), not Mx. Type distribution, "In the Rocky Mountains and the plains of Oregon."

Syracuse, Hamilton County (No. 80), in damp ground, rare. In the sand hills (No. 99), rare.

Baccharis salicina Torr. & Gr. Fl. ii, 258 (1841); *B. salicifolia* Nutt. Trans. Amer. Phil. Soc. vii, 337 (1841), not Pers. Type locality, "Banks of the Arkansa."

Moonlight, Stevens County (No. 179). Frequent.

Baccharis wrightii Gray, Pl. Wright. i, 101 (1852). Type locality, "Valley of the Limpia."

Ulysses, Grant County (No. 41), in flower, very rare. Johnson, Stanton County (No. 67), in fruit; not common.

Melampodium cinereum DC. Prodr. v, 518 (1836). The type was obtained "in Mexico and San Fernando."

Ulysses, Grant County (No. 17). Not abundant.

Engelmannia pinnatifida Gray; Nutt. Trans. Amer. Phil. Soc. vii, 343 (1841); *Silphium*, n. sp. Nutt.; Torr. Ann. Lyc. N. Y. ii, 215 (1826–28). Type locality, "The plains of the Red River."

Ulysses, Grant County (No. 14). Frequent.

Ambrosia psilostachya DC. Prodr. v, 526 (1836). Type found "in Mexico inter San Fernando et Matamoras."

Ulysses, Grant County (No. 28); on old plowed ground. Syracuse, Hamilton County (No. 160); abundant.

Xanthium canadense (?) Mill. Gard. Dict. ed. 8, no. 2 (1768).

Richfield, Morton County (No. 172). Common in moist places. Specimens immature.

Crassina grandiflora (Nutt.) Kuntze, Rev. Gen. Pl. i, 331 (1891); *Zinnia grandiflora* Nutt. Trans. Amer. Phil. Soc. vii, 348 (1841). Type distribution, "In the Rocky Mountains, toward Mexico."

Richfield, Morton County (No. 164). Sandy soil, Point of Rocks, abundant.

Lepachys columnaris (Pursh) Torr. & Gr. Fl. ii, 315 (1842); *Rudbeckia columnaris* Pursh, Fl. ii, 575 (1814). Originally collected "on the Missouri."

Ulysses, Grant County (No. 15). Common.

Lepachys tagetes (James) Gray, Pac. R. Rep. iv, 103 (1856); *Rudbeckia tagetes* James, Long Exped. ii, 68 (1823). Type locality, "about 15 miles southwest of the La Junta, Colorado."

Johnson, Stanton County (No. 68). Very common.

Helianthus annuus L. Sp. Pl. ii, 904 (1753). Type distribution, "In Peru, Mexico."

Ulysses, Grant County (No. 16 in part). In sand along the bank of North Fork Cimarron; rare.

Helianthus petiolaris Nutt. Journ. Acad. Phila. ii, 115 (1821). Type collected "on the sandy shores of the Arkansas."

With the last (No. 16 in part)

Thelesperma ambiguum Gray, Proc. Amer. Acad. xix, 16 (1883).

"This name is assigned to the radiate species which replaces *T. filifolium* in the western part of Texas and adjacent parts of New Mexico and Colorado."

Ulysses, Grant County (No. 52). Quite abundant in meadow land along West Fork Cimarron.

Thelesperma gracile (Torr.) Gray, Kew Journ. Bot. i, 252 (1849); *Bidens gracile* Torr. Ann. Lyc. N. Y. ii, 215 (1827). Type collected "on the Canadian?"

Ulysses, Grant County (No. 23). Frequent.

Hymenopappus flavescens Gray, Mem. Amer. Acad. ser. 2, iv, 97 (1849). The type was obtained "between San Miguel and Las Vegas, New Mexico." "Also a form of the same a few miles west of Willow Bar of the Cimarron," "and near the Cimarron by Dr. Wislizenus."

Ulysses, Grant County (No. 64). Hillsides.

Hymenopappus tenuifolius Pursh, Fl. ii, 742 (1814). Type collected "in Upper Louisiana."

Ulysses, Grant County (No. 24). On uplands.

Polypteris hookeriana (Torr. & Gr.) Gray, Proc. Amer. Acad. xix, 31 (1883); *Palafoxia hookeriana* Torr. & Gr. Fl. ii, 368 (1842); *Steria sphacelata* Nutt.; Torr. Ann. Lyc. N. Y. ii, 214 (1827), *nomen seminudum; Palafoxia texana* Hook. Icon. Pl. ii, 148 (1837), not DC. Type locality, "Texas."

Syracuse, Hamilton County (No. 76). Common in the sand hills.

Dysodia papposa (Vent.) Hitch. Trans. St. Louis Acad. v, 503 (1891); *Tagetes papposa* Vent. Jard. Cels, t. 36 (1801). Type "découverte par Michaux dans le pays des Illinois, introduite chez Cels en l'an 5."

Johnson, Stanton County (No. 73). Common along roadsides.

Hymenatherum aureum (Gray) Gray, Proc. Amer. Acad. xix, 42 (1883); *Lowellia aurea* Gray, Mem. Amer. Acad. ser. 2, iv, 91 (1849). Type collected "between Cold Spring and Upper Spring, west of Cimarron Creek."

Syracuse, Hamilton County (No. 152). On an island in the Arkansas River, 5 miles east of Syracuse; rare.

Gaillardia pulchella Foug. Mem. Acad. Paris (1786).

Ulysses, Grant County (No. 61). In the hills south of river; rare.

Ptilepida acaulis (Pursh) Britton, Mem. Torr. Club, v, 339 (1894); *Galardia acaulis* Pursh, Fl. ii, 743 (1814). Type collected "in upper Louisiana.

Richfield, Morton County (No. 169). Sandy slopes under Point of Rocks; rare.

Ptilepida scaposa (DC.) Britton, Mem. Torr. Club, v, 340 (1894); *Cephalophora scaposa* DC. Prodr. v, 663 (1836). Originally found "in Mexicanae prov. Texas district. orientalibus."

Ulysses, Grant County (No. 11). Frequent on the uplands.

Artemisia wrightii Gray, Proc. Amer. Acad. xix, 48 (1883); *A. ludoviciana mexicana* forma *tenuifolia* Gray, Pl. Wright. ii, 98 (1852). Type locality, "Mountains around the copper mines."

Liberal, Seward County (No. 184). Abundant.

Carduus ochrocentrus (Gray) Greene, Proc. Acad. Phila. 1892, 363 (1893); *Cirsium ochrocentrum* Gray, Mem. Amer. Acad. ser. 2, iv, 110 (1849). Type locality, "Mountain sides around Santa Fe."

Ulysses, Grant County (No. 49). Common.

Lactuca pulchella (Pursh) DC. Prodr. vii, 134 (1838); *Sonchus pulchellus* Pursh, Fl. ii, 502 (1814). Type collected "on the banks of the Missouri."

Syracuse, Hamilton County (No. 162). Bank of irrigating ditch; scarce.

Lygodesmia juncea (Pursh) Don, Edinb. Phil. Journ. vi, 311 (1829); *Prenanthes juncea* Pursh, Fl. ii, 498 (1814). The type plant grew "on the banks of the Missouri."

Ulysses, Grant County (No. 32). Abundant.

Lygodesmia rostrata (Gray) Gray, Proc. Amer. Acad. ix, 217 (1874); *L. juncea rostrata* Gray, Proc. Acad. Phila. 1863, 69 (1863). The type grew "on the plains."

Syracuse, Hamilton County (No. 105), north slope of sand hills.

APOCYNACEÆ.

Apocynum cannabinum L. Sp. Pl. i, 213 (1753). Type collected "in Canada, Virginia."

Syracuse, Hamilton County (No. 146). On an island in Arkansas River; rare.

ASCLEPIADACEÆ.

Asclepias arenaria Torr. Bot. Mex. Bound. 162 (1859). Type locality, "Journado del Muerte and on the upper Rio Grande, in New Mexico."

Syracuse, Hamilton County (No. 98). Common on sand hills.

Asclepias latifolia (Torr.) Britton, Mem. Torr. Club, v, 263 (1894); *A. obtusifolia latifolia* Torr. Ann. Lyc. N. Y. ii, 217 (1826–28). Type obtained "on the Canadian?"

Syracuse, Hamilton County (No. 140). Common.

Asclepias verticillata pumila Gray, Proc. Amer. Acad. xii, 71 (1876). Type range, "Nebraska to near Mexico."

Syracuse, Hamilton County (No. 84). Frequent along the hillsides bordering the north of the valley.

Acerates angustifolia (Nutt.) Dec. in DC. Prodr. viii, 522 (1844); *Polyotus angustifolius* Nutt. Trans. Amer. Phil. Soc. ser. 2, v, 201 (1837). Type plant found "in dry prairies from Fort Smith to Red River."

Syracuse, Hamilton County (No. 147). Frequent.

GENTIANACEÆ.

Eustoma russellianum (Hook.) Griseb. in DC. Prodr. ix, 51 (1845); *Lisianthus russellianus* Hook. Bot. Mag. t. 3626 (1839); *Lisianthus glaucifolius* Nutt. Trans. Amer. Phil. Soc. ser. 2, v, 197 (1837), not Jacq. Type found "on the sandy banks of the Great Salt River of Arkansas."

Syracuse, Hamilton County (No. 107). Common.

POLEMONIACEÆ.

Gilia aggregata (Pursh) Spreng. Syst. i, 626 (1825); *Cantua aggregata* Pursh, Fl. i, 147 (1814). Type obtained "on the banks of the Mississippi."

Moonlight, Stevens County (No. 176). Abundant in the sand hills.

Gilia inconspicua (Smith) Sweet, Hort. Brit. 286 (1826); *Ipomopsis inconspicua* Smith, Exot. Bot. i, 25 (1804).

Syracuse, Hamilton County (No. 153). On land subject to overflow by the river; rare.

BORAGINACEÆ.

Heliotropium convolvulaceum (Nutt.) Gray, Mem. Amer. Acad. vi, 403 (1857); *Euploca convolvulacea* Nutt. Trans. Phil. Soc. v, 190 (1837). Type locality, "On the sandy banks of the Arkansa."

Syracuse, Hamilton County (No. 95). Abundant in the sand hills.

Heliotropium curassavicum L. Sp. Pl. i, 130 (1753). Type distribution, "Americæ calidioris maritimis."

Ulysses, Grant County (No. 18). In bottom of dried-up ponds; abundant.

Lappula texana (Scheele) Britton, Mem. Torr. Club, v, 273 (1894); *Echinospermum texanum* Scheele, Linnæa, xxv, 260 (1852); *Cynoglossum pilosum* Nutt. Gen. i, 114 (1818), not Ruiz & Pav. The type was found "on arid hills above Rapid River, Missouri."

Syracuse, Hamilton County (No. 79). On ditch banks; rare.

Oreocarya suffruticosa (Torr.) Greene, Pittonia, i, 57 (1887); *Myosotis suffruticosa* Torr. Ann. Lyc. N. Y. ii, 225 (1827). Type locality, "Barren deserts along the Platte."

Syracuse, Hamilton County (No. 97). Frequent in the sand hills.

Lithospermum angustifolium Mx. Fl. i, 130 (1803). Type collected "ad flumen Ohio."

Syracuse, Hamilton County (No. 85). Found occasionally in Arkansas Valley.

CONVOLVULACEÆ.

Ipomœa leptophylla Torr. in Frem. First Rep. 94 (1843). Type locality, "Forks of the Platte to Laramie River." It was also "collected about the sources of the Canadian" by Dr. James in Long's expedition.

Ulysses, Grant County (No. 33). Abundant.

Convolvulus incanus Vahl, Symb. iii, 23 (1794). Type locality, "America."

Ulysses, Grant County (No. 39). Very rare.

Evolvulus nuttalianus Roem. & Schult. Syst. vi, 198 (1820); *E. argenteus* Pursh, Fl. i, 187 (1814), not R. Br. Type collected "on the banks of the Missouri."

Ulysses, Grant County (No. 10). Sandy soil; abundant.

Cuscuta indecora neuropetala (Engelm.); *C. neuropetala* Engelm. Amer. Journ. Sci. xlv, 75 (1843). Type locality, "Texas, in wet prairies near Houston."

Syracuse, Hamilton County (No. 159). Frequent in lowlands.

SOLANACEÆ.

Solanum nigrum L. Sp. Pl. i, 186 (1753). Type locality not given.

Syracuse, Hamilton County (No. 114). Frequent in timbered land.

Solanum rostratum Dunal, Hist. Sol. 234 (1813).

Ulysses, Grant County (No. 30). Very abundant.

Physalis lobata Torr. Ann. Lyc. N. Y. ii, 226 (1827). Type collected "on the Canadian?"

Syracuse, Hamilton County (No. 77). Very common in damp places.

Physalis longifolia Nutt. Trans. Amer. Phil. Soc. v, 193 (1837). Type collected "on sandy banks of the Arkansas near Belle Point."

Syracuse, Hamilton County (No. 104). Sand hills; not common.

Physalis virginiana Mill. Dict. ed. 8, no. 4 (1768). No locality given.

Ulysses, Grant County (No. 31). On high uplands in "buffalo wallows."

Chamæsaracha coniodes (Moric.) Britton, Mem. Torr. Club, v, 287 (1894); *Solanum coniodes* Moric.; DC. Prodr. xiii, 64 (1852). The type was obtained "in Mexico inter Laredo et Bejar (Berlan. Pl. exsic. Mex. n. 1463, et 1494)."

Ulysses, Grant County (No. 29); Syracuse, Hamilton County (No. 190). Frequent about excavations.

SCROPHULARIACEÆ.

Pentstemon albidus Nutt. Gen. ii, 53 (1818). Type distribution, "On the plains of the Missouri, common from the confluence of the river Platte to the mountains."

Syracuse, Hamilton County (No. 83). In the sand hills; frequent.

PEDALIACEÆ.

Martynia louisiana Mill. Gard. Dict. ed. 8, no. 3 (1768); *M. proboscidia* Glox. Obs. 14 (1785). Type locality, "ad Mississippi flumen."

Ulysses, Grant County (No. 4). Roadsides and waste places. Syracuse, Hamilton County (No. 88).

VERBENACEÆ.

Verbena bracteosa Mx. Fl. ii, 13 (1803). The plant was originally found "in regione Illinoensi et in urbe Nash-ville."

Ulysses, Grant County (No. 42). Frequent around old cellars.

Verbena stricta Vent. Jard. Cels, t. 53 (1801). The type plant was "decouverte, en 1792, par Michaux dans le pays des Ilinois, introduite chez Cels en l'an 5."

Syracuse, Hamilton County (No. 154). Frequent.

Lippia cuneifolia (Torr.) Steud. Nomencl. ii, 54 (1841); *Zapania cuneifolia* Torr. Ann. Lyc. N. Y. ii, 234 (1827). Type collected "on the Platte."

Ulysses, Grant County (No. 22). Abundant in lowlands.

LAMIACEÆ.

Mentha canadensis L. Sp. Pl. ii, 577 (1753). Originally collected "in Canada."

Syracuse, Hamilton County (No. 158). Moist places; frequent.

Lycopus sinuatus Ell. Bot. S. Car. & Georg. i, 26 (1816). Type obtained "on the Ogeechee River, Vall' Ambrosa."

Syracuse, Hamilton County (No. 116). Dry sloughs; abundant.

Salvia lanceolata Willd. Enum. 37 (1809). Type locality not given.

Johnson, Stanton County (No. 69). Abundant on plowed ground.

Scutellaria lateriflora L. Sp. Pl. ii, 598 (1753). Originally found "in Canada, Virginia."

Syracuse, Hamilton County (No. 115). Abundant along dry sloughs.

Teucrium occidentale Gray, Syn. Fl. ii, pt. i, 349 (1878). Range, "Nebraska to New Mexico, Arizona, and on the Sacramento, California."

Syracuse, Hamilton County (No. 157). Common in the woods.

NYCTAGINACEÆ.

Allionia linearis Pursh, Fl. ii, 728 (1814). Originally collected "in upper Louisiana."

Ulysses, Grant County (No. 58). Frequent in the valleys.

Abronia fragrans Nutt.; Hook. Kew Journ. Bot. v, 261 (1853). Type found "on loamy, sandy, firm banks, within the high drift sand hills of the lower Platte."

Syracuse, Hamilton County (No. 124). Frequent on ditch banks.

Abronia micrantha Torr. in Frem. First Rep. 96 (1843). Type locality, "Near the mouth of Sweet Water River [Wyoming]." Dr. Gray changes the name of this plant to *A. cycloptera*[1] on the ground that Dr. Torrey's type "was founded on the precociously fertilized state of a species, the fully developed flowers of which are the very largest of the genus." He further states, "I will not hesitate in this case to change the specific name."

Syracuse, Hamilton County (No. 101). Rare; in gravelly washes along Arkansas River.

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[1] Amer. Journ. Sci., ser. 2, xv, 319 (1853).

AMARANTHACEÆ.

Amaranthus retroflexus L. Sp. Pl. ii, 991 (1753). Originally collected "in Pensylvania."

Syracuse, Hamilton County (No. 137). Abundant on irrigated land.

Cladothrix lanuginosa (Nutt.) Moq. in DC. Prodr. xiii, pt. 2, 359 (1849); *Achyranthes lanuginosa* Nutt. Trans. Amer. Phil. Soc. ser. 2, v, 166 (1837). Type collected "on the sand beaches of Great Salt River, Arkansas."

Ulysses, Grant County (No. 28). On plowed ground and earth heaps.

Frœlichia floridana (Nutt.) Moq. in DC. Prodr. xiii, pt. 2, 420 (1849); *Oplotheca floridana* Nutt. Gen. ii, 79 (1818). Type collected "on the banks of the Altamaha, Florida."

Ulysses, Grant County (No. 66). On old building site, Syracuse, Hamilton County (No. 92). Frequent in sand hills.

CHENOPODIACEÆ.

Cycloloma atriplicifolium (Spreng.) Coulter, Mem. Torr. Club, v, 143 (1894); *Kochia atriplicifolia* Spreng. Nacht. Fl. Hal. i, 35 (1801).

Syracuse, Hamilton County (No. 119). Common along banks of Arkansas River.
Ulysses, Grant County (No. 51). North Fork Cimarron River, in sand.

Chenopodium album L. Sp. Pl. i, 219 (1753). Type collected "in agris Europæ."

Syracuse, Hamilton County (No. 130). Common on irrigated land.

Atriplex canescens (Pursh) James, Cat. 178 (1825); *Calligonum canescens* Pursh, Fl. i, 370 (1814). Type collected "in the plains of the Missouri, near the Big-bend."

Richfield, Morton County (No. 166). Frequent in the crevices of the rocks at Point of Rocks.

Atriplex expansa Wats. Proc. Amer. Acad. ix, 116 (1874); *Obione argentea* Torr. in Emory, Mil. Recon. 149 (1848). The type stated to be "abundant in sandy saline places on the Del Norte."

Syracuse, Hamilton County (No. 145). Abundant on irrigated land.

POLYGONACEÆ.

Eriogonum annuum Nutt. Trans. Amer. Phil. Soc. v, 164 (1837). Type plant found "on the banks of the Great Salt River of Arkansas, and near the confluence of the Kiawesha and Red rivers."

Moonlight, Stevens County (No. 178). Common in sandy land.

Eriogonum lachnogynum Torr.; Benth. DC. Prodr. xiv, 8 (1856). The type was collected "in Novo-Mexico (Fendler n. 765) in montibus scopulosis (Gordon)."

Richfield, Morton County (No. 165). Common on the crest of the rocks at Point of Rocks.

Eriogonum longifolium Nutt. Trans. Amer. Phil. Soc. v, 164 (1837). The type was found "on the ledges of the Cadron rocks and denudated prairies from Arkansas to Red River."

Moonlight, Stevens County (No. 177). Plentiful in the sand hills.

Polygonum convolvulus L. Sp. Pl. i, 364 (1753). Originally collected "in Europæ agris."

Syracuse, Hamilton County (No. 90). Rare; sheltered places.

EUPHORBIACEÆ.

Euphorbia dentata Mx. Fl. ii, 211 (1803). Type collected "in Tennessee, juxta Nashville."

Syracuse, Hamilton County (No. 148). Common.

Euphorbia fendleri Torr. & Gr. Pac. R. Rep. ii, 175 (1855). Type data, "Big Springs of the Colorado, April. This species is No. 800 of Fendler's New Mexico collection."

Richfield, Morton County (No. 167). Common about Point of Rocks.

Euphorbia geyeri Engelm.; Engelm. & Gr. Pl. Lindh. 52 (1845). Type locality, "Beardstown, Illinois, and Upper Missouri; Geyer."

Syracuse, Hamilton County (No. 94). Common.

Euphorbia glyptosperma Engelm. Bot. Mex. Bound. 187 (1859); *E. polygonifolia* Hook. Fl. Bor. Amer. ii, 140 (1838), not L. Type distributed, according to Engelmann, "on the Rio Grande; also on the Arkansas, and extending to the Upper Missouri." Hooker's habitat is: "Canada (Pursh) to Carleton House Fort, on the Saskatchawan. *Drummond.* On Menzies Island and at the Grand Rapids of the Columbia, N. W. America, *Douglas.*"

Ulysses, Grant County (No. 2). On piles of earth thrown from cellars and wells; on high land. Syracuse, Hamilton County (No. 142). Common.

Euphorbia lata Engelm. Bot. Mex. Bound. 188 (1859); *E. dilatata* Torr. & Gr. Pac. R. Rep. ii, 175 (1855), not Hochst. Type locality, "Western Texas. Not uncommon in New Mexico."

Ulysses, Grant County (No. 20). Valley of a tributary to North Fork Cimarron; very rare.

Euphorbia marginata Pursh, Fl. ii, 607 (1814). Originally collected "on the Yellow-stone River."

Syracuse, Hamilton County (No. 150). Abundant.

Euphorbia petaloidea Engelm. Bot. Mex. Bound. 185 (1859). No type locality; var. *nuttallii* is made to replace *E. arenaria* Nutt.,[1] the type distribution of which is "On the sandy banks of the Arkansas and Red rivers."

Ulysses, Grant County (No. 60). Sandy banks along south side of North Fork Cimarron; frequent.

Euphorbia serpens H. B. K. Nov. Gen. & Sp. ii, 52 (1817). The type was found "in umbrosis Cumanæ prope Bordones et Punta Araya."

Syracuse, Hamilton County (No. 136). Common.

Euphorbia stictospora Engelm. Bot. Mex. Bound. 187 (1859). Type distribution, "From Kansas (Fendler, 798) to Santa Fe (Fendler, 797) and Dona Ana (Wright, 59), New Mexico, and Corallites, Chihuahua; Thurber."

Syracuse, Hamilton County (Nos. 128, 141). Common.

Croton texensis (Klotzsch) Muell. Arg. in DC. Prodr. xv, pt. 2, 692 (1862); *Hendecandra texensis* Klotzsch in Erichs. Archiv. i, 252 (1841); *Croton muricatus* Nutt. Trans. Amer. Phil. Soc. v, 153 (1837), not Vahl. The type grew "on the sandy beaches of the Great Salt River, Arkansas."

Ulysses, Grant County (No. 50). By the roadsides and in sandy places along the river; frequent. Johnson, Stanton County (No. 187).

Ditaxis humilis (Engelm. & Gr.) Pax, in Engler. & Prantl, Nat. Pfl. Fam. iii, abt. 5, 45 (1890); *Aphora humilis* Engelm. & Gr. Bost. Journ. Nat. Hist. 262 (1845). "In hard clayey soil west of the Brazos (also Texas, Drummond, collection second, No. 230, and Dr. Wright)."

Syracuse, Hamilton County (No. 86). Frequent.

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[1] Nutt. Pl. Ark. 171 (1837), not H. B. K.

SALICACEÆ.

Salix fluviatilis Nutt. Sylva, i, 73 (1842); *S. longifolia* Muhl. Neue Schrift Gesell. Naturf. Freunde Berlin, iv, 238 (1803), not Lam. The author states: "This species lines the immediate border of the Oregon a little below its confluence with the Wahlamet."

Syracuse, Hamilton County (No. 113). Abundant in lowland along the Arkansas River.

IRIDACEÆ.

Sisyrinchium bermudiana L. Sp. Pl. ii, 954 (1753). Type collected "in Virginia."

Syracuse, Hamilton County (No. 118). Abundant in meadow land; Collier's ranch.

LILIACEÆ.

Yucca glauca Nutt. Fraser's Cat. 119, No. 89. The type was "collected 1,600 miles up the Missouri, about lat. 49°."

Hamilton County, 14 miles south of Syracuse (No. 75). Abundant throughout southwestern Kansas, especially on the sand hills.

COMMELINACEÆ.

Commelina virginica L. Sp. Pl. ed. 2, i, 61 (1762). Type collected "in Virginia."

Syracuse, Hamilton County (No. 91). Common; north slope of sand hills.

CYPERACEÆ.

Cyperus schweinitzii Torr. Ann. Lyc. N.Y. iii, 276 (1836); *C. alternifolius* Schwein. in Keating, Nar. Long's 2d Exp. ii, 381 (1824), not R. Br. Type locality not given in the above, which is "a Catalogue of Plants collected in the Northwestern Territory by Mr. Thomas Say in the year 1823." Localities given by Torrey: "Dry sand in the shore of Lake Ontario, near Grace, Monroe County, New York, Dr. Samuel B. Bradley!; on the Arkansas River, Nuttall!; on the river St. Peter?, Mr. Say!."

Ulysses, Grant County (No. 8). On uplands; scarce.

Scirpus americanus Pers. Syn. i, 68 (1805); *Scirpus triqueter* Mx. Fl. i, 30 (1803), not L. Type collected "in Carolina inferiore."

Ulysses, Grant County (No. 35). Abundant in marshy places.

Scirpus lacustris L. Sp. Pl. i, 48. Type distribution, "In Europæ aquis puris stagnantibus & fluviatilibus."

Syracuse, Hamilton County (No. 117). Abundant in swampy land; Collier's ranch.

POACEÆ.

Andropogon hallii Hack. Sitz. Akad. Wiss. Wien. lxxxix, 127 (1884).

Moonlight, Stevens County (No. 182); Ulysses, Grant County (No. 13). Rare; in spots on high uplands, forming small patches a few feet in diameter.

Andropogon nutans avenaceus (Mx.) Hack. in DC. Monog. Phan. vi, 530 (1889); *Andropogon avenaceum* Mx. Fl. Bor. Amer. i, 58 (1803). Type distribution, "In vastissimus pratis Illinoensibus."

Moonlight, Stevens County (No. 181). Common in the Cimarron Valley.

Andropogon saccharoides glaucus (Torr.) Scribn. Mem. Torr. Club, v, 28 (1894); *A. glaucus* Torr. Ann. Lyc. N. Y. i, 153 (1824). Type collected "on the Canadian River."

Ulysses, Grant County (No. 54). Valley lands, rare.

Panicum capillare L. Sp. Pl. i, 58 (1753). Type locality, "Virginia, Jamaica."

Ulysses, Grant County (No. 56); Syracuse, Hamilton County (No. 134). Rare; in the valleys.

Panicum crus-galli L. Sp. Pl. i, 56 (1753). Type locality, "Europæ, Virginiæ cultis."

Syracuse, Hamilton County (No. 131). Frequent in wet land.

Setaria viridis (L.) Beauv. Agrost. 51 (1812); *Panicum viride* L. Syst. Veg. ed. 10, ii, 870 (1759). No locality.

Syracuse, Hamilton County (No. 129). Frequent along irrigation ditches.

Cenchrus tribuloides L. Sp. Pl. ii, 1050 (1753). Type collected "in Virginiæ maritimis."

Syracuse, Hamilton County (No. 82). Common in sandy soil.

Aristida fasciculata Torr. Ann. Lyc. N. Y. i, 154 (1824). Type distribution, "In forests of the Canadian River."

Ulysses, Grant County (No. 63). Abundant.

Sporobolus airoides (Torr.) Torr. Pac. R. Rep. vii, pt. iii, 21 (1856); *Agrostis airoides* Torr. Ann. Lyc. N. Y. i, 151 (1824). Type obtained "on the branches of the Arkansas, near the Rocky Mountains."

Ulysses, Grant County (No. 36). Abundant in valleys.

Sporobolus cryptandrus (Torr.) Gray, Man. 576 (1848); *Agrostis cryptandra* Torr. Ann. Lyc. N. Y. i, 151 (1824). Type collected "on the Canadian River."

Ulysses, Grant County (No. 44). Rare.

Calamovilfa longifolia (Hook.) Hack. True Grasses, 113 (1890); *Calamagrostis longifolia* Hook. Fl. Bor. Amer. i, 241 (1840). Type locality, "Saskatchawan."

Moonlight, Stevens County (No. 183). Common in the sand hills.

Spartina cynosuroides (L.) Willd. Enum. i, 80 (1809); *Dactylis cynosuroides* L. Sp. Pl. i, 71 (1753). Type locality, "Virginia, Canada, Lusitania."

Syracuse, Hamilton County (No. 156). Common in sloughs.

Spartina gracilis Trin. Mem. Acad. St. Petersb. ser. 6, iv, 110 (1840). Type locality, "Amer. bor."

Syracuse, Hamilton County (No. 110). In moist lowland; rare.

Chloris verticillata Nutt. Trans. Amer. Phil. Soc. n. ser. v, 150 (1837). Type collected "on the sandy banks of the Arkansas, near Fort Smith."

Ulysses, Grant County (No. 55). Common.

Schedonnardus paniculatus (Nutt.) Trelease; Branner & Coville, Rep. Geol. Surv. Ark. 1888, pt. 4, 236 (1891); *Lepturus paniculatus* Nutt. Gen. i, 81 (1818). Type found "on dry, saline plains, near Fort Mandan, on the Missouri."

Johnson, Stanton County (No. 71). Frequent along roadsides and about excavations.

Bouteloua curtipendula (Mx.) Torr. Bot. Emory Exped. 153 (1848); *Chloris curtipendula* Mx. Fl. i, 59 (1803) Type distribution, "In aridis regionis Illinoensis ad Wabash et in rupibus ad prairie du rocher."

Ulysses, Grant County (No. 57). Syracuse, Hamilton County (No. 127). Quite common.

Bouteloua hirsuta Lag. Var. Cienc. y Litter. 2, pt. 4, 141 (1805). Type locality as given in Lagasca, Genera et species, "In Imp. Mex."

Syracuse, Hamilton County (No. 125). Abundant everywhere.

Bouteloua oligostachya (Nutt.) Torr. in Gray, Man. ed. 2, 553 (1856); *Atheropogon oligostachyum* Nutt. Gen. i, 78 (1818). Type collected "on the plains of the Missouri."

Ulysses, Grant County (No. 53). Syracuse, Hamilton County (No. 126). Frequent. For method of cross pollination see page 537.

Bulbilis dactyloides (Nutt.) Raf. Kuntze, Rev. Gen. Pl. ii, 763 (1891); *Sesleria dactyloides* Nutt. Gen. i, 65 (1818). The type grew "on the open grassy plains of the Missouri."

Johnson, Stanton County; pistillate plant (No. 72) and staminate (No. 189).

Munroa squarrosa (Nutt.) Torr. Pac. R. Rep. iv, 158 (1856); *Crypsis squarrosa* Nutt. Gen. i, 49 (1818). Type found growing "on the arid plains near the 'Grand Detour' of the Missouri."

Ulysses, Grant County (No. 48). Rather frequent, and especially abundant on banks of earth thrown from wells and cellars; also on very sandy soil.

Eragrostis major Host, Gram. Austr. iv, 14 (1809); *Briza eragrostis* L. Sp. Pl. i, 70 (1753), not *Eragrostis eragrostis* (L.) Beauv. Type found "in Europa australi ad agrorum versuras."

Syracuse, Hamilton County (No. 138). Common on cultivated land.

Eragrostis oxylepis (Torr.) Torr. Pac. R. Rep. iv, 156 (1856); *Poa oxylepis* Torr. in Marcy, Expl. Red River, 269, t. 19 (1854); *Poa interrupta* Nutt. in Trans. Amer. Phil. Soc. n. ser. v, 146 (1837), not Lam. Type obtained "in bushy prairies near the sandy banks of the Arkansas."

Moonlight, Stevens County (No. 180). Abundant on the sand hills.

Eatonia obtusata (Mx.) Gray, Man. ed. 2, 558 (1856); *Aira obtusata* (Mx.) Fl. i, 62 (1803). The type was found "in aridis, a Carolina ad Floridam."

Ulysses, Grant County (No. 62). At edge of dry river bed.

Distichlis spicata (L.) Greene, Bull. Cal. Acad. ii, 415 (1887); *Uniola spicata* L. Sp. Pl. i, 71 (1753). Type locality, "in America borealis maritimis."

Ulysses, Grant County (No. 25). Abundant in lowlands.

Festuca elatior pratensis (Huds.) Hack. Monogr. Fest. Europ. 150 (1882), as subspecies; *Festuca pratensis* Huds. Fl. Angl. 37 (1762). Type locality, [England,] "In pratis et pascuis."

Syracuse, Hamilton County (No. 132). Rare; introduced along irrigation ditches.

Agropyron repens glaucum (Desf.) Scribner, Mem. Torr. Club, v, 57 (1894). *Triticum glaucum* Desf. Tabl. Bot. Mus. 16 (1804) will not hold for citation, since it is a *nomen nudum*. I am unable to determine with any certainty the name to be used for the form. The type locality of *Triticum glaucum* DC. and *Agropyron glaucum* Roem. & Schult. is European.

Ulysses, Grant County (No. 59). Not uncommon in meadows along the North Fork of the Cimarron.

Agropyron tenerum Vasey, Bot. Gaz. x, 258 (1885). The type "common throughout the Rocky Mountains."

Syracuse, Hamilton County (No. 109). Rare; moist lowland, Collier's ranch.

Hordeum jubatum L. Sp. Pl. 85 (1753). Type locality, "Canada."

Ulysses, Grant County (No. 21). Abundant along the bed of a tributary creek.

Elymus canadensis L. Sp. Pl. i, 83 (1753). Type locality, "Canada."

Syracuse, Hamilton County (No. 135). Rare; in moist places.

Elymus elymoides (Raf.) Swezey, Cat. Neb. Pl. 15 (1891); *Sitanion elymoides* Raf. Journ. Phys. lxxxix, 103 (1819). Type locality, "Missouri."

Ulysses, Grant County (No. 43). Found only in bottoms of deserted cellar excavations among rubbish deposited there by the wind.

LIST OF SPECIMENS.

1. Meriolix serrulata (Nutt.) Walp.
2. Euphorbia glyptosperma Engelm.
3. Astragalus mollissimus Torr.
4. Martynia louisiana Mill.
5. Cæsalpinia jamesii (Torr. & Gr.) Fisher.
6. Eriocarpum spinulosum (Pursh) Greene.
7. Chrysopsis villosa hispida (Hook.) Gray.
8. Cyperus schweinitzii Torr.
9. Kuhnistera purpurea (Vent.) MacMillan.
10. Evolvulus nuttallianus Roem. & Schult.
11. Ptilepida scaposa (DC.) Britton.
12. Malvastrum coccineum (Pursh) Gray.
13. Andropogon hallii Hack.
14. Engelmannia pinnatifida Gray.
15. Lepachys columnaris (Pursh) Torr. & Gr.
16. Helianthus annuus L.
    Helianthus petiolaris Nutt.
17. Melampodium cinereum DC.
18. Heliotropium curassavicum L.
19. Paronychia jamesii Torr. & Gr.
20. Euphorbia lata Engelm.
21. Hordeum jubatum L.
22. Lippia cuneifolia (Torr.) Steud.
23. Thelesperma gracile (Torr.) Gray.
24. Hymenopappus tenuifolius Pursh.
25. Distichlis spicata (L.) Greene.
26. Kuhnistera compacta (Spreng.) Kuntze.
27. Parosela aurea (Nutt.) Britton.
28. Ambrosia psilostachya DC.
29. Chamæsaracha coniodes (Moric.) Britton.
30. Solanum rostratum Dunal.
31. Physalis virginiana Mill.
32. Lygodesmia juncea (Pursh) Don.
33. Ipomœa leptophylla Torr.
34. Lythrum alatum Pursh.
35. Scirpus americanus Pers.
36. Sporobolus airoides (Torr.) Torr.
37. Glycyrrhiza lepidota Pursh.
38. Parosela enneandra (Nutt.) Britton.
39. Convolvulus incanus Vahl.
40. Kuhnistera multiflora (Nutt.) Heller.
41. Baccharis wrightii Gray.
42. Verbena bracteosa Mx.
43. Elymus elymoides (Raf.) Swezey.
44. Sporobolus cryptandrus (Torr.) Gray.
45. Cucurbita fœtidissima H. B. K.
46. Callirhoe involucrata (Nutt.) Gray.
47. Aster tanacetifolius H. B. K.
48. Munroa squarrosa (Nutt.) Torr.
49. Carduus ochrocentrus (Gray) Greene.
50. Croton texensis (Klotzsch) Muell.
51. Cycloloma atriplicifolium (Spreng.) Coulter.
52. Thelesperma ambiguum Gray.
53. Bouteloua oligostachya (Nutt.) Torr.
54. Andropogon saccharoides glaucus (Torr.) Scribner.
55. Chloris verticillata Nutt.
56. Panicum capillare L.
57. Bouteloua curtipendula (Mx.) Torr.
58. Allionia linearis Pursh.
59. Agropyron repens glaucum (Desf.) Scribner.
60. Euphorbia petaloidea Engelm.
61. Gaillardia pulchella Foug.
62. Eatonia obtusata (Mx.) Gray.
63. Aristida fasciculata Torr.
64. Hymenopappus flavescens Gray.
65. Aster ericæfolius Rothrock.
66. Frœlichia floridana (Nutt.) Moq.
67. Baccharis wrightii Gray.
68. Lepachys tagetes (James) Gray.
69. Salvia lanceolata Willd.
70. Gaura coccinea Pursh.
71. Schedonnardus paniculatus (Nutt.) Trelease.
72. Bulbilis dactyloides (Nutt.) Raf.
73. Dysodia papposa (Vent.) Hitchcock.
74. Mentzelia multiflora (Nutt.) Gray.
75. Yucca glauca Nutt.
76. Polypteris hookeriana (Torr. & Gr.) Gray.
77. Physalis lobata Torr.
78.
79. Lappula texana (Scheele) Britton.
80. Erigeron divergens Torr. & Gr.
81. Linum rigidum Pursh.
82. Cenchrus tribuloides L.
83. Pentstemon albidus Nutt.
84. Asclepias verticillata pumila Gray.
85. Lithospermum angustifolium Mx.
86. Ditaxis humilis (Engelm. & Gr.) Pax.
87. Sophora sericea Nutt.
88. Martynia louisiana Mill.
89. Tribulus maximus L.
90. Polygonum convolvulus L.
91. Commelina virginica L.
92. Frœlichia floridana (Nutt.) Moq.
93. Cristatella erosa Nutt.
94. Euphorbia geyeri Engelm. & Gr.
95. Heliotropium convolvulaceum (Nutt.) Gray.
96. Kuhnistera villosa (Nutt.) Kuntze.
97. Oreocarya suffruticosa (Torr.) Greene.
98. Asclepias arenaria Torr.
99. Erigeron divergens Torr. & Gr.
100. Symphoricarpos occidentalis Hook.
101. Abronia micrantha Torr.
102. Rhus radicans L.
103. Parosela lanata (Spreng.) Britton.
104. Physalis longifolia Nutt.
105. Lygodesmia rostrata (Gray) Gray.
106. Galpinsia hartwegii (Benth.) Britton.
107. Eustoma russellianum (Hook.) Griseb.
108. Cyrtorhyncha cymbalaria (Pursh) Britton.
109. Agropyron tenerum Vasey.
110. Spartina gracilis Trin.
111. Parthenocissus vitacea (Knerr) Hitchcock.
112. Amorpha fruticosa L.
113. Salix fluviatilis Nutt.
114. Solanum nigrum L.
115. Scutellaria lateriflora L.
116. Lycopus sinuatus Ell.
117. Scirpus lacustris L.
118. Sisyrinchium bermudiana L.
119. Cycloloma atriplicifolium (Spreng.) Coulter.
120. Rhus trilobata (Nutt.) Torr. & Gr.
121. Polanisia trachysperma Torr. & Gr.
122. Erysimum asperum (Nutt.) DC.
123. Mentzelia nuda (Pursh) Torr. & Gr.
124. Abronia fragrans Nutt.
125. Bouteloua hirsuta Lag.
126. Bouteloua oligostachya (Nutt.) Torr.

127. Bouteloua curtipendula (Mx.) Torr.
128. Euphorbia stictospora Engelm.
129. Setaria viridis (L.) Beauv.
130. Chenopodium album L.
131. Panicum crus-galli L.
132. Festuca elatior pratensis (Huds.) Hack.
133. Gaura parviflora Dougl.
134. Panicum capillare L.
135. Elymus canadensis L.
136. Euphorbia serpens H. B. K.
137. Amaranthus retroflexus L.
138. Eragrostis major Host.
139. Astragalus scobinulatus Sheldon.
140. Asclepias latifolia (Torr.) Britton.
141. Euphorbia stictospora Engelm.
142. Euphorbia glyptosperma Engelm.
143. Megapterium canescens (Torr. and Frem.) Britton.
144. Argemone alba Lestib.
145. Atriplex expansa Wats.
146. Apocynum cannabinum L.
147. Acerates angustifolia (Nutt.) Dec.
148. Euphorbia dentata Mx.
149. Psoralea tenuiflora Pursh.
150. Euphorbia marginata Pursh.
151. Portulaca oleracea L.
152. Hymenatherum aureum (Gray) Gray.
153. Gilia inconspicua (Smith) Sweet.
154. Verbena stricta Vent.
155. Acuan illinoensis (Mx.) Kuntze.
156. Spartina cynosuroides (L.) Willd.
157. Teucrium occidentale Gray.
158. Mentha canadensis L.
159. Cuscuta indecora neuropetala (Engelm.) Hitchcock.
160. Ambrosia psilostachya DC.
161. Vernonia baldwinii Torr.
162. Lactuca pulchella (Pursh) DC.
163. Onagra biennis (L.) Scop.
164. Crassina grandiflora (Nutt.) Kuntze.
165. Eriogynum lachnogynum Torr.
166. Atriplex canescens (Pursh) James.
167. Euphorbia fendleri Torr. & Gr.
168. Gutierrezia sarothræ (Pursh) Britton & Rusby.
169. Ptilepida acaulis (Pursh) Britton.
170. Krameria secundiflora DC.
171. Calceolaria verticillata (Ort.) Kuntze.
172. Xanthium canadense (?) Mill.
173. Vernonia marginata (Torr.) Britton.
174. Lacinaria punctata (Hook.) Kuntze.
175. Solidago missouriensis Nutt.
176. Gilia aggregata (Pursh) Spreng.
177. Eriogonum longifolium Nutt.
178. Eriogonum annuum Nutt.
179. Baccharis salicina Torr. & Gr.
180. Eragrostis oxylepis (Torr.) Torr.
181. Andropogon nutans avenaceus (Mx.) Hack.
182. Andropogon halii Hack.
183. Calamovilfa longifolia (Hook.) Hack.
184. Artemisia wrightii Gray.
185. Cleome serrulata Pursh.
186. Grindelia squarrosa (Pursh) Dunal.
187. Croton texensis (Klotzsch) Muell.
188.
189. Bulbilis dactyloides (Nutt.) Raf.
190. Chamæsaracha coniodes (Moric.) Britton.
191. Parosela enneandra (Nutt.) Britton.
192. Eriocarpum spinulosum (Pursh) Greene.
193. Phaca pectinata Hook.

CREPIS OCCIDENTALIS AND ITS ALLIES.

By Frederick V. Coville.

While examining a recent collection of plants from eastern Washington, Mr. John B. Leiberg came upon an undescribed Crepis, which is published below as *Crepis barbigera*. In order to render clear the relation of this plant to *C. occidentalis*, I undertook to make a critical study of the latter, a work which is now completed, with the unexpected result of bringing to light several apparently distinct species. The material used was obtained from the United States National Herbarium, and the herbaria of Harvard University, Columbia College, the Philadelphia Academy of Sciences, the California Academy of Sciences, the University of California, the Catholic University of America, the New York College of Pharmacy, the Delaware Natural History Society, and the Missouri Botanical Garden, in which are contained all the existing type specimens, besides an excellent series of other material.

The related species *C. acuminata* and *C. intermedia* are not considered in the present paper, for, like some of the other species of the genus, they require further work for their proper understanding.

ANALYTICAL KEY TO THE SPECIES.

a. Bristly hairs, if present, glandular.
  b. Stem not conspicuously hirsute.
    c. Plant tomentose throughout; lobes of the leaves acute or acuminate. *C. occidentalis.*
    cc. Plant almost devoid of tomentum; lobes of the leaves obtuse or broadly acute. *C. bakeri.*
  bb. Stem conspicuously hirsute. *C. monticola.*
aa. Bristly hairs present and not glandular.[1]
  b. Plant rarely more than 30 cm. high; basal leaves not exceeding 20 cm. in length.
    c. Achenia narrower at the apex, but without a distinct beak.
      d. Achenia brown and striate-costate at maturity. *C. subacaulis.*
      dd. Achenia usually olive-green and not costate at maturity. *C. scopulorum.*
    cc. Achenia tapering into a distinct beak. *C. rostrata.*
  bb. Plant more than 30 cm. high; basal leaves more than 20 cm. long. *C. barbigera.*

[1] Specimens of *C. subacaulis* occasionally have no bristly hairs.

CREPIS OCCIDENTALIS Nutt.

Plant perennial, 8 to 25 (rarely 40) cm. high; stems single or sometimes two or three from a single caudex, corymbosely branching above, rarely from near the base, bearing like the leaves a close tomentum (this often thin and sometimes with a tendency to fall in age), often with glandular bristly hairs above, particularly on the peduncles; leaves from runcinately toothed to deeply pinnatifid (especially the cauline), the lobes in the latter case oblong to linear and often themselves toothed; involucre 12 to 16 mm. long, calyculate, tomentose like the leaves and stem, and often, like the peduncles, bearing a few short glandular bristles; achenia from orange to brown in color, 8 to 10 mm. long, fusiform, truncate at the apex, 10- to 18-costate, minutely strigose, especially toward the apex between the costæ. PLATE XXI.

In its normal form *C. occidentalis*, the most widely distributed of the seven species discussed in the present paper, is a tomentose plant with glandular-hirsute inflorescence, 15 to 25 cm. high, but in stature it often varies beyond these limits. It is essentially a plant of the Great Basin region, in drier and more exposed areas becoming more tomentose and less glandular-hirsute (as in Hillman's specimens from Reno, Nevada), and in the western extensions of its range, where it penetrates the Sierra Nevada and Cascade Range toward the milder Pacific Coast climate, losing to some extent its tomentose character, as illustrated by Suksdorf's specimens from western Klikitat County, Washington, and Rattan's plant from the coast ranges of California.

SYNONYMY.

Crepis occidentalis Nutt. Journ. Acad. Phila. vii, 29 (1834). Type specimen in the Harvard University Herbarium, collected "on the borders and in the vicinity of the river Columbia" by Nathaniel B. Wyeth. This single specimen, from which Nuttall drew his description, is without basal leaves and has corollas yet unopened. It furnishes, therefore, no achenium characters. The involucral bracts and peduncles bear a few glandular bristles scattered through the tomentum. A plant collected by Thomas Howell in "rocky places, eastern Oregon" (No. 140), and distributed as *Malacothrix crepoides*, exactly resembles in size, pubescence, and other characters Nuttall's type specimen, and is from the same region.

Psilochenia occidentalis Nutt. Trans. Amer. Phil. Soc. ser. 2, vii, 437 (1841). Type specimen in the Harvard University Herbarium, collected on the Platte River, probably toward its headwaters in Wyoming. The specimen itself is marked "R. Mts.," i. e., Rocky Mountains; but the name of the collector, presumably Nuttall himself, is not given. Specimens exactly resembling Nuttall's plant in all its characters, but larger and more fully developed, were collected in the year 1864 in Middle Park, Colorado, by C. C. Parry.

Crepis occidentalis costata Gray, Bot. Cal. i, 435 (1876). Type specimen in the Harvard University Herbarium, collected on Stansbury Island, Great Salt Lake, Utah, by Sereno Watson, in June, 1869 (No. 715, King Survey). This is a robust plant, about 20 cm. high, with spreading, stout branches, large leaves, and unusually glandular inflorescence, and bearing mature achenia in which the costæ are fully developed. This plant was again collected in 1883, at the same place, by Thomas Meehan.

SPECIMENS EXAMINED.

British Columbia:

Spences Bridge, *James Fletcher*, 1885.

Kamloops, *John Macoun*, 1889.

Washington:

"Columbia River," *N. B. Wyeth.*

Whitman County, Wawawai, *C. V. Piper*, 1894 (No. 1784).

Klikitat County, near Lyle, *W. N. Suksdorf*, 1886 (No. 875); near Cleveland, *W. N. Suksdorf*, 1884 (No. 381). The former possibly *Crepis bakeri*, but with acute leaf-lobes.

CREPIS OCCIDENTALIS Nutt.

Oregon:
"Eastern Oregon," *T. T. Howell*, 1880.
Union County, *W. C. Cusick*, 1878 (No. 635, in part).
Josephine County, Grant Pass, *T. T. Howell*, 1884 (No. 172).
Idaho:
Clearwater, *H. H. Spalding*.
Nez Perces County, near Lewiston, *J. H. Sandberg*, 1892 (No. 268); near Lake Waha, *L. F. Henderson*, 1894.
Montana:
Custer, *J. W. Blankinship*, 1890.
Wyoming:
Uinta County, La Barge, *E. Stevenson*, 1894.
Yellowstone National Park, near Mammoth Hot Springs, *F. H. Furglehaus*, 1893.
Colorado:
Without locality, *Hall* and *Harbour*, 1862 (No. 353).
Durango, *Alice Eastwood*, 1891.
Gunnison County, *Alice Eastwood*, 1889.
Fremont County, *T. S. Brandegee*, 1874.
Middle Park, *C. C. Parry*, 1864.
"Head waters of Clear Creek," *C. C. Parry*, 1861 (No. 70).
Soda Springs, *T. S. Brandegee*, 1874.
Utah:
Great Salt Lake, *Thomas Meehan*, 1883.
Stansbury Island, altitude 1,300 meters, *Sereno Watson*, 1869 (No. 715, in part).
"Southern Utah, northern Arizona, etc.," *Edward Palmer*, 1877 (No. 291).
Nevada:
Reno, *F. H. Hillman*, 1890, 1894.
Unionville Valley, *Sereno Watson*, 1868 (No. 715, in part).
Carson City, *C. L. Anderson*, 1865.
Washoe and Pleasant valleys, *Stretch*, 1865.
California:
Sierra County, *J. G. Lemmon*, 1874 (No. 131).
San Bernardino Mountains, Bear Valley, *Parish Brothers*, 1882 (No. 1459); *S. B. Parish*, 1894 (No. 3048).
Inyo County, *Julian Rixford*, 1892.
Mendocino County, Elk Ridge, *H. N. Bolander*, 1867 (No. 6498).
Mountains east of Round Valley, *Volney Rattan*, 1884, in part.
Summit of Mount Sanhedrin, *J. W. Blankinship*, 1893.
Mount Hamilton, *W. H. Brewer*, 1860–62 (No. 1304).
Siskiyou County, near Yreka, *E. L. Greene*, 1876 (No. 811).
San Benito County, Cantua Creek, *Alice Eastwood*, 1893. Possibly *Crepis subacaulis*.
Arizona:
Without locality, *Edward Palmer*, 1869.

CREPIS BAKERI Greene.

"Stoutish and low, seldom a foot high, neither woolly nor even cinereous, the pubescence rather scanty and mostly hirsutulous: leaves half as long as the stem, deeply pinnatifid into oblong and spatulate spreading lobes, or merely coarsely toothed, or in small plants quite entire: stem parted from the middle, or below it, into three to six pedunculiform monocephalous branches: involucre three-fourths of an inch high, with both long and short slenderly acuminate bracts: achenes acutely costate, tapering from the middle.

"In pine woods, near Egg Lake, Modoc County, California, June 8, 1894, Milo S. Baker. A member of the group to which *C. occidentalis* belongs, but exhibiting none

of the tomentose pubescence usual to this group; the involucre peculiar." Greene, Erythea, iii, 73 (1895).

Type specimen in the herbarium of the University of California. This plant bears on its peduncles and involucre, and sometimes more sparingly on its leaves and stem, the glandular hairs commonly found in *C. occidentalis*, but it lacks the usual tomentum of that species, while the narrow lobes of its deeply pinnatifid leaves are obtuse or at most broadly acute. From *C. monticola* it differs in the scantiness of the glandular-hirsute pubescence and its almost entire absence from the stem, besides the character of the leaf lobes described above.

SPECIMENS EXAMINED.

California:

Modoc County, near Egg Lake, *Baker* and *Nutting*, 1894.

Mendocino County, mountains east of Round Valley, *Volney Rattan*, 1884, in part.

CREPIS MONTICOLA Coville, sp. nov.

Plant perennial, with a single stem from each caudex, 12 to 25 cm. high; stem striate-angulate, hirsute, the hairs glanduliferous and commonly 2 to 3 mm. long; leaves variable in form, sometimes with merely irregularly dentate margins, sometimes deeply pinnatifid with toothed or even pinnatifid lobes, less densely hirsute and with shorter hairs than the stem, devoid of tomentum; involucres barely calyculate, 15 to 20 or even 23 mm. long, bearing glanduliferous bristles like the stem, and usually with scant tomentum also; mature achenia not seen. PLATE XXII.

Type specimen in the herbarium of the Catholic University, Washington, collected May 26, 1876, near Yreka, Siskiyou County, California, by Edward L. Greene (No. 810).

This plant, which has hitherto been referred erroneously to *Crepis occidentalis crinita*, differs from *C. occidentalis* in its hirsute stem and leaves, its obsolescent tomentum, and its longer involucres; from *C. subacaulis* in the presence of glands on its bristly hairs and in the absence of tomentum on its stem and leaves.

SPECIMENS EXAMINED.

California:

Sierra County, Sierra Nevada, *J. G. Lemmon*, 1874 (No. 462), 1875, and 1880.

Modoc County, Big Valley, *Baker* and *Nutting*, 1894.

Plumas County, *Mrs. Pulsifer Ames*, 1875.

Lassen County, Susanville, *T. S. Brandegee*, 1892.

Siskiyou County, near Yreka, *E. L. Greene*, 1876 (No. 810).

"Snow Mountains," *T. S. Brandegee*, 1892.

Oregon:

Cascade Mountains, Grant Pass, *T. T. Howell*, 1884 (No. 173).

CREPIS SUBACAULIS (Kellogg).

Plant perennial, with one to three stems from each caudex, commonly 10 to 15 cm. high, in one very large specimen almost 35 cm. and in another depauperate one only 6 cm.; stem striate-angulate, hirsute with glandless divaricate hairs often 2 mm. long, rarely devoid of these hairs, scantily or densely tomentose, cymosely branching, usually from near the base; leaves deeply pinnatifid or bipinnatifid, with the same pubescence as the stem, the long hairs borne particularly upon the petiole and midrib; anthodia variable in height, on stout, usually long, peduncles; involucre 12 to 22 (usually more than 15) mm. long, tomentose like the stem and leaves, and usually provided with a few long glandless bristles, either stramineous or greenish black in color; achenia (not fully mature) about 8 to 10 mm. long, 10- to 15-costate, scabrous toward the apex. PLATE XXIII.

This plant bears a resemblance, in the case of its larger, more hirsute, and less tomentose specimens, to *C. monticola*, in its smaller, nonhirsute, and more tomentose

CREPIS MONTICOLA Coville

CREPIS SUBACAULIS (Kellogg) Coville.

PLATE XXIV.

CREPIS SCOPULORUM Coville.

representatives to *C. occidentalis*, but differs from both in bearing no glandular hairs. Dr. Kellogg's *C. occidentalis nevadensis* was subsequently united with his *C. occidentalis subacaulis* by Dr. Gray, and with this view of their relation the writer is inclined to concur, but a good series of specimens may show that the former belongs rather with *C. occidentalis*. *Crepis subacaulis* is closely related to *C. scopulorum*, but it differs from that species in its usually lower stature, stem branching more nearly to the base with the branches more widely spreading, usually more tomentose leaves and stems, commonly broader lobes of the leaf blades, and its costate achenia, which are similar to those of *Crepis occidentalis*. The achenium character appears to constitute the crucial distinction between the two species.

SYNONYMY.

Crepis occidentalis subacaulis Kellogg, Proc. Cal. Acad. v, 50 (1873). Type specimen in the Harvard University Herbarium, collected June 27, 1870, by Albert Kellogg and S. Brannan, jr., in the Sierra Nevada of California, at the altitude of about 2,100 meters, near Cisco, Placer County. The specimen is a depauperate one, rising about 6 cm. above the ground and bearing a single anthodium. Besides its rather dense tomentum, it bears a few nonglandular bristles on its petioles and stem. The small outline figure in plate 23 is a drawing of this type specimen.

Crepis occidentalis nevadensis Kellogg, Proc. Cal. Acad. v, 50 (1873). Type locality, the "summit of the Sierra Nevada," in California. Type specimen, which appears to have been lost, said to have been collected June 16, 1870, in California, "at the summit of the Sierra Nevada, * * * altitude 7,000 or 8,000 feet (2,133 to 2,438 meters)," presumably along the line of the Central Pacific Railway. There is a specimen in the Harvard University Herbarium and another in the herbarium of the California Academy, dated July 10, 1870, from the Sierra Nevada, presumably collected at the type station, and it is probable that these are the specimens upon which, in part, Dr. Kellogg based his description. In this specimen the bristles usually present in the species are entirely wanting. Jones's specimens from Nevada County have the characters of the original *nevadensis*.

Crepis modocensis Greene, Erythea, iii, 48 (1895). Type specimen in the herbarium of the Catholic University, Washington, collected in June, 1894, on lava beds, under juniper trees, Modoc County, California, by Mrs. R. M. Austin. The plant is doubtfully referred here on account of its pubescence, achenia, and the form of its leaves, notwithstanding its large stature, which gives it a general resemblance to *C. scopulorum*. These specimens and those of Lemmon from Sierra Valley, in neither of which are the achenia mature, render the question of intergradation between this species and *C. scopulorum* uncertain. Both localities are on transition ground geographically, and only fuller series of mature specimens can decide the matter.

SPECIMENS EXAMINED.

California:

Placer County, Cisco, alt. 2,100 meters, *Kellogg* and *Brannan*, 1870.
Emigrant Gap, *M. E. Jones*, 1882 (No. 2784).
Sierra County (?), *J. G. Lemmon*, 1875–76 (No. 1274).
Sierra County, Sierra Valley, *J. G. Lemmon*, 1880 (No. 80).
San Bernardino Mountains, Bear Valley, alt. 1,800 meters, *S. B. Parish*, 1886.
Nevada County (?), "Summit of Sierra Nevada," *Albert Kellogg*, 1870; "Summit," *Bolander* and *Kellogg*, 1872.
Nevada County, Soda Springs, *M. E. Jones*, 1881.
Modoc County, Mrs. *R. M. Austin*, 1894.

CREPIS SCOPULORUM Coville, sp. nov.

Perennial, 10 to 25 (rarely 40) cm. high; stem single, or rarely two from the same caudex, bearing one to five anthodia cymosely arranged (the lower peduncles sometimes arising near the ground), scantily tomentose, usually glabrate in age, and bear-

ing toward the base scattered eglandulose bristles; leaves similar in pubescence to the stem, the blades cleft almost to the midrib, the divisions linear-lanceolate and sharply toothed or lobed; peduncles slender, usually thicker just beneath the anthodium; involucre 10 to 12 mm. high, scantily tomentose, bearing a few greenish black or green eglandulose hairs usually 2 to 3 mm. long; achenia 7 to 9 mm. long, fusiform, truncate at the apex, olive-green or sometimes reddish brown in color at maturity, not costate but sometimes marked with lines of paler color in place of costæ. PLATE XXIV.

Type specimen in the United States National Herbarium, collected August 16, 1893, in the Yellowstone National Park, by J. N. Rose.

This plant is distinguishable from *Crepis occidentalis* by its uniformly deeply cut glabrescent leaves, the eglandulose bristly hairs of its stem and involucral bracts, and its noncostate achenia. Red achenia have been seen only in Hillman's specimens from Reno, Nevada.

SPECIMENS EXAMINED.

Oregon:

Blue Mountains, *T. T. Howell*, 1885.

Idaho:

Boise City, *A. Isabel Mulford*, 1892.

Montana:

Without definite locality, *F. D. Kelsey*, 1887.
Helena, *F. W. Anderson*, 1887.
Near Jefferson River, *F. Lamson-Scribner*, 1883 (No. 126*b*).
Beaverhead County, *Frank Tweedy*, 1888 (No. 221).
Deer Lodge, *F. W. Traphagen*, 1888.

Wyoming:

Yellowstone National Park, *J. N. Rose*, 1893 (No. 680); *Frank Tweedy* (No. 736).
Wind River Mountains (?), *J. C. Fremont*, 1843 (No. 680).
Uinta County, La Barge, *E. Stevenson*, 1894.

Utah:

Wasatch Mountains, *Sereno Watson*, 1869 (No. 715, in part).
Kane County, *A. L. Siler*.
Sevier County, Glenwood, *Lester F. Ward*, 1875 (No. 107).

Nevada:

West Humboldt Mountains, *E. L. Greene*, 1894.
Near Reno, foothills, *F. H. Hillman*, 1894.

CREPIS ROSTRATA Coville, sp. nov.

Plant perennial, 15 to 30 cm. high, with one to three stems from each caudex; stems striate-angulate, with little or no tomentum, sparingly hirsute, especially below, with glandless hairs; leaves with similar pubescence (the bristles often confined to the midrib and petioles), their blades deeply pinnatifid into linear-lanceolate, toothed or pinnatifid divisions; anthodia one to three on each stem, on long, stout peduncles, these slightly contracted just beneath the anthodium; involucre 12 to 15 mm. high, devoid of tomentum (except in some cases at the very base), either densely clothed or only scantily provided with long glandless hairs (of a milk-white color in our freshly dried specimens); achenia 7 to 11 mm. long, not costate, olive-green at maturity and usually marked with lines of fainter color, the upper part contracted into a distinct beak 2 to 3 mm. long. PLATE XXV.

Type specimen in the United States National Herbarium, collected June 18, 1893, near Crab Creek, Douglas County, Washington, at the altitude of about 750 meters, by J. H. Sandberg and J. B. Leiberg.

This plant differs from *C. occidentalis* in the same characters as those given under *C. scopulorum*, and is a close relative of that species. Its conspicuously beaked achenia, the milk-white color of the involucral hairs, and the usual absence of tomentum

CREPIS ROSTRATA Coville.

PLATE XXVI.

CREPIS BARBIGERA Leiberg.

on the involucral bracts, together with its more scapose character and the thickness of its peduncles, serve to distinguish it from *C. scopulorum*. It may yet be found that intergradation occurs.

SYNONYMY.

Crepis occidentalis crinita Gray, Bot. Cal. i, 435 (1876), not *Crepis crinita* Solander (1831). Type specimen in the Harvard University Herbarium, collected in the year 1841, on the eastern side of the Cascade Mountains, between the Natches (Spipen) and Wenatchee rivers, by the botanists of the Wilkes Expedition. In the type specimen the involucral hairs are unusually dense, and from lying long on herbarium shelves have changed from a milk-white to a dirty yellow color, while the achenia, although beaked, do not show that character so conspicuously as do the mature specimens now collected.

SPECIMENS EXAMINED.

Washington:

Between the Natches (Spipen) and Wenatchee rivers, *Pickering* and *Brackenridge*, 1841.

Douglas County, Crab Creek, *Sandberg* and *Leiberg*, 1893 (No. 225).

Klikitat County, *Joseph Howell*, 1879.

British Columbia:

Spences Bridge, *James Fletcher*, 1885.

CREPIS BARBIGERA Leiberg, sp. nov.

Plant perennial, stout, 40 to 50 cm. high, minutely viscid-pubescent when living, appearing slightly tomentose when dry; basal leaves usually ample, with long petioles, their blades 15 to 30 cm. long, oblong-lanceolate in outline, runcinately toothed to pinnatifid, but seldom deeply parted; cauline leaves mostly small and few, variously pinnatifid or the uppermost even entire; anthodia commonly 10 to 20, fastigiately corymbose; involucre 11 to 15 mm. long, sparingly tomentose, resiniferous; bracts strongly carinately costate from base to apex, the costa setosely barbate with one or two rows of long, stout, yellow or yellowish green, divaricate or even slightly reflexed bristles; corollas more or less deeply and very irregularly five-toothed; achenia acutely 10- to 12-costate, 8 to 10 mm. long, tapering upward, dilated at the apex, olive-green in color when near maturity; pappus rather copious, somewhat shorter than the achenium. PLATE XXVI.

Type specimen in the United States National Herbarium, collected June 25, 1893, near Alkali Lake, Douglas County, Washington, at an altitude of 400 meters, by J. H. Sandberg and John B. Leiberg (No. 313).

This species is a much larger and more robust plant than *Crepis occidentalis*, and is easily distinguishable from it, in addition to other characters, by the conspicuous nonglandular bristles of the involucre and the scant tomentum of the leaves. It has usually been distributed as *C. occidentalis crinita*. In some of Howell's specimens from eastern Oregon the bristles of the involucral bracts are almost wanting, and the plant then bears a close general resemblance to *Crepis intermedia*.

SPECIMENS EXAMINED.

Washington:

Without definite locality, *E. W. Hilgard*, 1882.

Douglas County, near Alkali Lake, *Sandberg* and *Leiberg*, 1893 (No. 313).

Klikitat County, western part, *W. N. Suksdorf*, 1885 (No. 777).

Klikitat County, *G. R. Vasey*, 1883.

Spokane County, prairies, *W. N. Suksdorf*, 1884 (No. 378).

Kittitass County, Cle Elum, *E. L. Greene*, 1890.

Oregon:

Eastern Oregon, rocky hillsides, *T. T. Howell*, 1881 (No. 139).

Mouth of Hood River, *W. N. Suksdorf*, 1883 (No. 150).

PLANTS FROM THE BIG HORN MOUNTAINS OF WYOMING.

By J. N. Rose.

INTRODUCTORY STATEMENT.

Mr. Frank Tweedy, of the Geological Survey, made a small but very interesting collection of plants in the Big Horn Mountains of Wyoming in 1893. No attempt was made by Mr. Tweedy to get a complete representation of the flora of this region, which is extremely rich and varied. His collecting was merely incidental to his other work, and was done chiefly while reaching some mountain peak or returning from it to camp. His plants, therefore, are chiefly alpine.

The Big Horn Mountains begin near the middle of the northern boundary of Wyoming, running in a northwest and southeast direction for about one-third the distance across the State. The mountains are very much broken and very rugged on the flanks, and there are few or no trails. They contain many peaks which are 9,000 to 11,000 feet in altitude.

Mr. Tweedy speaks of the geology and topography of this region as follows:

The Big Horn range where crossed has a width of 35 miles, trending to the northwest, with elevations varying from 5,000 feet at base to 11,000 feet on the highest summits. The range gradually slopes to the northward, running out in southern Montana, and about 12 miles south of our route rises to the rugged summits of Cloud Peak, 13,500 feet in elevation. The range is a broad anticlinal arch, presenting a wide Archæan core, with narrow bands of sedimentary formation on the east and west flanks dipping very abruptly to the plains below, so as to form exceedingly precipitous bluffs and slopes of from 1,500 to 2,000 feet. The interior presents a marked contrast, being generally composed of broad, flat ridges and summits covered with beautiful grassy parks and patches of heavy timber. Southward the country becomes more rugged and broken, and the timber more frequent and denser. Great areas have been swept over by forest fires, making traveling exceedingly slow and difficult. The drainage of the interior is peculiar in that the streams have north and south courses before they break through the rim in deep, rough, and often inaccessible canyons.

Mr. Tweedy fitted out near the town of Sheridan, going into the mountains up Little Goose Creek, crossing the divide near the head waters of the Big Goose Creek, and then going down Shell Creek into the Big Horn Basin.

His stations in the Big Horn Mountains are between longitude 107° and 107° 30′ and latitude 44° 30′ and 44° 40′, chiefly on the head waters

of the east and west forks of Big Goose Creek and on the high divide between these streams and Shell Creek. The topography of the region is shown in the Dayton Sheet of the Geographical Survey, published in 1895.

The collection is composed of only 90 species, represented by 96 numbers. The date of the collection is from July 15 to 24, 1893, inclusive. Mr. Tweedy has carefully given the approximate altitudes of the species, which have been appended in the catalogue.

During 1893 I collected quite extensively in northwestern Wyoming, especially in the Yellowstone Park and the timber-land reserve to the east. The flora of the Big Horn Mountains is very similar to that of the Yellowstone National Park. Nearly one-fourth of the species enumerated below were observed by me. The similarity of the floras of the two regions is confirmed by Mr. Tweedy, who says, "The flora of this region does not differ materially from that of the adjacent main Rocky Mountain range to the west in Wyoming and northwest in Montana." Mr. Tweedy states also that the altitude of the timber line varies from 9,500 to 10,000 feet.

A large part of the collection consists of alpine plants. The following comprises those species found at an altitude of 9,000 to 11,300 feet:

Anemone narcissiflora.
Artemisia scopulorum.
Calandrinia grayi.
Carex atrata.
Carex capitata.
Carex nova.
Carex scirpoidea.
Dryas octopetala.
Erigeron lanatus.
Geum rossii.
Kalmia glauca microphylla.
Mertensia alpina.
Myosotis sylvatica alpestris.
Omphalodes howardi.
Orthocarpus pilosus.
Pedicularis parryi.
Primula parryi.
Ptilepida grandiflora.
Ranunculus eschscholtzii.
Salix chlorophylla.
Salix glauca villosa.
Silene acaulis.

The Carices have been named by L. H. Bailey; the willows by the late M. S. Bebb, who has described the single new variety contained in the collection.

CATALOGUE OF SPECIES.

Clematis alpina occidentalis (Hornem.) Gray in Newton & Jenney, Geol. Surv. Black Hills, 531 (1880); *Atragene occidentalis* Hornem. Hort. Hafn. 520 (1813).
Rocky woods, altitude 2,460 meters (8,000 feet), July 21 (No. 78).

Thalictrum fendleri Engelm. Mem. Amer. Acad. n. ser. iv, 5 (1849).
Altitude 2,150 meters (7,000 feet), July 15 (No. 15).

Anemone narcissiflora L. Sp. Pl. i, 542 (1753).
Common; altitude 2,825 to 3,390 meters (9,500 to 11,000 feet), July 20 (No. 51).

Pulsatilla hirsutissima (Pursh) Britton, Ann. N. Y. Acad. vi, 217 (1891); *Clematis hirsutissima* Pursh, Fl. ii, 385 (1814); *Anemone patens nuttalliana* Gray, Man. ed. 5, 36 (1867); *Pulsatilla nuttalliana* Spreng. Syst. ii, 663 (1825).
Altitude 2,460 meters (8,000 feet), July 20 (No. 52).

Trollius laxus Salisb. Trans. Linn. Soc. viii, 303 (1807).
Bogs and cold woods, altitude 2,460 meters (8,000 feet), July 21 (No. 85).

Ranunculus eschscholtzii Schlecht. Animad. Ran. ii, 16, t. 1 (1820).
Altitude 3,390 meters (11,000 feet), July 15 (No. 29).

Caltha leptosepala DC. Syst. i, 310 (1818).
Cold bogs; altitude 3,200 meters (10,400 feet), July 20 (No. 45).

Delphinium menziesii DC. Syst. i, 355 (1818).
Grassy slopes, altitude 2,215 meters (7,200 feet), July 21 (No. 75).

Berberis aquifolium Pursh, Fl. i, 219 (1814); *Berberis repens* Lindl. Bot. Reg. 14, t. 1176 (1828).
Open woods, altitude 2,460 meters (8,000 feet), July 21 (No. 79).

Stanleya pinnata (Pursh) Britton, Trans. N. Y. Acad. viii, 62 (1888); *Cleome pinnata* Pursh, Fl. ii, 739 (1814).
Sandy hills on Sage Creek near Corbett, altitude 2,000 meters (6,500 feet), July 21 (No. 92).

Viola labradorica Schrank, Denksch. Bot. Ges. Regensb. ii, 12 (1818); *Viola canina muhlenbergii* (Torr.) Traut. Act. Hort. Petrop. v, 28 (1877); *Viola muhlenbergii* Torr. Fl. U. S. i, 256 (1824).
Subalpine, altitude 3,230 meters (10,500 feet), July 15 (No. 21).

Silene acaulis L. Sp. Pl. ed. 2, i, 603 (1762).
Alpine, altitude 3,390 meters (11,000 feet). July 20 (No. 42).

Alsine obtusa; *Stellaria obtusa* Engelm. Bot. Gaz. vii, 5 (1882).
Bog, altitude 2,300 meters (7,500 feet), July 20 (No. 59).

Calandrinia grayi Britton, Bull. Torr. Club, xvii, 312 (1890); *Calandrinia pygmæa* Gray, Proc. Amer. Acad. vii, 623 (1873); *Talinum pygmæa* Gray, Amer. Journ. Sci. ser. 2, xxxiii, 407 (1862).
Alpine, altitude 3,390 meters (11,000 feet), July 25 (No. 26).

Claytonia lanceolata Pursh, Fl. i, 175, pl. 3 (1814).
Altitude 2,650 meters (8,600 feet), July 15 (No. 6).

Geranium incisum Nutt.; Torr. & Gr. Fl. i, 206 (1838).
Moist meadows and wet woods, altitude 2,460 meters (8,000 feet), July 15 (No. 17).

Geranium richardsonii Fisch. & Trautv. Ind. Sem. Hort. Petrop. iv, 37 (1838).
Wet meadows and open woods, altitude 2,300 meters (7,500 feet), July 20 (No. 58).

Lupinus argenteus Pursh, Fl. ii, 468 (1814).
Meadows, altitude 2,400 meters (7,800 feet), July 15 (No. 13).

Lupinus argenteus argophyllus Wats. Proc. Amer. Acad. viii, 532 (1873).
Alpine, altitude 3,390 meters (11,000 feet), July 20 (No. 39).

Psoralea lanceolata Pursh, Fl. ii, 475 (1814).
Alkali flats near Corbett, altitude 2,000 meters (6,500 feet), July 24 (No. 94).

Rubus strigosus Mx. Fl. i, 297 (1803).
Crevices of rocks, altitude 2,400 meters (7,800 feet), July 20 (No. 82).

Dryas octopetala L. Sp. Pl. i, 501 (1753).
Alpine, altitude 3,390 meters (11,000 feet), July 15 (No. 23).

Geum rossii (R. Br.) Seringe, DC. Prodr. ii, 553 (1825); *Sieversia rossii* R. Br. Chl. Melv. 18, tab. c (1823).
Alpine, altitude 3,390 meters (11,000 feet), July 20 (No. 31).

Geum triflorum Pursh, Fl. ii, 736 (1814).
Altitude 2,650 meters (8,600 feet), July 15 (No. 7).

Fragaria vesca L. Sp. Pl. i, 494 (1753).
Altitude 2,300 meters (7,500 feet), July 20 (No. 55).

Potentilla dissecta Pursh, Fl. i, 355 (1814).
Subalpine, altitude 3,080 meters (10,000 feet), July 20 (No. 50).

Potentilla glandulosa Lindl. Bot. Reg. xix, t. 1583 (1833).
Rocky places, altitude 2,300 meters (7,500 feet), July 20 (No. 74).

Rosa nutkana Presl, Epim. Bot. 203 (1849).
In meadows, altitude 2,150 meters (7,000 feet), July 15 (No. 14).

Amelanchier alnifolia Nutt.; Torr. & Gr. Fl. i, 473 (1840); *Aronia alnifolia* Nutt. Gen. i, 306 (1818).
Altitude 2,150 meters (7,000 feet), July 21 (No. 73).

Saxifraga integrifolia Hook. Fl. Bor. Amer. i, 249, t. 86 (1834).
Altitude 2,770 meters (9,000 feet), July 20 (No. 34).

Ribes lacustre (Pers.) Poir, Encycl. Suppl. ii, 856 (1811); *R. oxyacanthoides lacustre* Pers. Syn. i, 252 (1805).
Rocky places, altitude 2,615 meters (8,500 feet), July 20 (No. 63); subalpine, altitude 3,230 meters (10,500 feet), July 15 (No. 25).

Ribes viscosissimum Pursh, Fl. i, 163 (1814).
Open rocky places, altitude 2,460 meters (8,000 feet), July 21 (No. 80).

Ribes oxyacanthoides saxosum (Hook.) Coville, Contr. Nat. Herb. iv, 101 (1893); *R. saxosum* Hook. Fl. Bor. Amer. i, 231 (1834).
Altitude 2,460 meters (8,000 feet), July 15 (No. 16).

Sedum stenopetalum Pursh, Fl. i, 324 (1814).
Meadows, altitude 2,400 meters (7,800 feet), July 21 (No. 89).

Mentzelia lævicaulis (Dougl.) Torr. & Gr. Fl. i, 535 (1840); *Bartonia lævicaulis* Dougl.; Hook. Fl. Bor. Amer. i, 221, t. 69 (1834).
Rocky hills near Corbett, altitude 2,000 meters (6,500 feet), July 20 (No. 95).

Valeriana sylvatica Banks, App. Frankl. Journ. ed. 2, 2 [730] (1823).
Woods, altitude 2,460 meters (8,000 feet), July 21 (No. 83).

Erigeron lanatus Hook. Fl. Bor. Amer. ii, 17, t. 121 (1834).
Alpine, altitude 3,390 meters (11,000 feet), July 15 (No. 28).

Erigeron salsuginosus (Richards.) Gray, Proc. Amer. Acad. xvi, 93 (1880); *Aster salsuginosus* Richards. App. Frankl. Journ. ed. 2, 32 [748] (1823).
Meadows, altitude 2,680 meters (8,700 feet), July 20 (No. 36); altitude 2,460 meters (8,000 feet), July 20 (No. 54).

Antennaria carpathica (Wahl.) Hook. Fl. Bor. Amer. i, 329 (1833); *Gnaphalium carpathicum* Wahl. Fl. Carp. 258, t. 3 (1814).
Altitude 2,770 meters (9,000 feet), July 15 (No. 4); altitude 2,090 meters (6,800 feet), July 20 (No. 64).

Antennaria racemosa Hook. Fl. Bor. Amer. i, 330 (1834).
Open dry pine woods, altitude 2,400 meters (7,800 feet), July 21 (No. 81).

Iva axillaris Pursh, Fl. ii, 743 (1814).
Sandy flats along Sage Creek below Corbett, altitude 2,000 meters (6,500 feet), July 24 (No. 90).

Balsamorhiza hookeri incana (Nutt.) Gray, Syn. Fl. i, pt. ii, 266 (1884); *Balsamorhiza incana* Nutt. Trans. Amer. Phil. Soc. ser. 2, vii, 351 (1841).
Grassy hills, altitude 2,460 meters (8,000 feet), July 15 (No. 18).

Ptilepida grandiflora; *Actinella grandiflora* Torr. & Gr. Bost. Journ. Nat. Hist. v, 169 (1847).
Alpine, altitude 3,080 meters (10,000 feet), July 20 (No. 40).

Artemisia scopulorum Gray, Proc. Phil. Acad. xv, 66 (1864).
Alpine, altitude 3,070 meters (10,000 feet), July 15 (No. 32).

Arnica alpina (L.) Olin, Mon. Arn. Upsala (1799); *Arnica montana alpina* L. Sp. Pl. ii, 884 (1753).
Open places, altitude 2,460 meters (8,000 feet), July 20 (No. 61).

Arnica cordifolia Hook. Fl. Bor. Amer. i, 331 (1833).
Woods, altitude 2,460 meters (8,000 feet), July 15 (No. 60).

Senecio pauciflorus Pursh, Fl. ii, 529 (1814); *Senecio aureus borealis* Torr. & Gr. Fl. ii, 442 (1843).
Altitude 2,090 meters (6,800 feet), July 20 (No. 65).

Agoseris gracilenta Greene, Pittonia, ii, 177 (1891); *Troximon gracilens* Gray, Proc. Amer. Acad. xix, 71 (1883).
Altitude 2,680 meters (8,700 feet), July 20 (No. 38). This species is not often collected.

Agoseris scorzoneræfolia Greene, Pittonia, ii, 177 (1891); *Ammogeton scorzoneræfolium* Schrad. Cat. Sem. Goett. 1 (1833); *Troximon glaucum dasycephalum* Torr. & Gr. Fl. ii, 490 (1843).
Meadows, altitude 2,680 meters (8,700 feet), July 20 (No. 37).

Kalmia glauca microphylla Hook. Fl. Bor. Amer. ii, 41 (1834).
Alpine, altitude 3,390 meters (11,000 feet), July 20 (No. 44).

Primula parryi Gray, Amer. Journ. Sci. ser. 2, xxxiv, 257 (1862).
Very common in crevices of rocks and along alpine streams, altitude between 2,825 and 3,390 meters (9,500 and 11,000 feet), July 21 (No. 84).
Peduncles sometimes 25-flowered. Mr. Tweedy remarks: "*Primula parryi* is a marked feature of the flora from 7,000 feet to the highest summits."

Dodecatheon pauciflorum (Durand) Greene, Pittonia, ii, 72 (1890); *Dodecatheon meadia pauciflorum* Durand, Journ. Phil. Acad. ser. 2, iii, 95 (1855).
Cold bogs, altitude 2,150 to 3,390 meters (7,000 to 11,000 feet), July 20 (No. 56).

Omphalodes howardi Gray, Proc. Amer. Acad. xx, 263 (1885); *Cynoglossum howardi* Gray, Syn. Fl. ii, pt. i, 188 (1884).
Alpine, altitude 3,390 meters (11,000 feet), July 20 (No. 43).

Mertensia alpina Don, Hist. Dichl. Pl. iv, 372 (1838).
Alpine, altitude 3,325 meters (10,800 feet), July 20 (No. 49).

Mertensia oblongifolia Don, Hist. Dichl. Pl. iv, 372 (1838).
Along streams, altitude 2,770 meters (9,000 feet), July 20 (No. 33).

Myosotis sylvatica alpestris Koch, Syn. Fl. Germ. Helv. ed. 3, 438 (1857); *Myosotis alpestris* F. W. Schmidt, Fl. Boem. iii, 26 (1795).
Subalpine, altitude 3,230 meters (10,500 feet), July 20 (No. 57); alpine, altitude 3,390 meters (11,000 feet), July 15 (No. 24).

Veronica alpina L. Sp. Pl. i, 11 (1753).
Alpine, altitude 2,770 meters (9,000 feet), July 15 (No. 5).

Castilleja pallida septentrionalis (Lindl.) Gray, Bot. Cal. i, 575 (1876); *C. septentrionalis* Lindl. Bot. Reg. xi, t. 925 (1825).
Altitude 2,090 meters (6,800 feet), July 20 (No. 66).

Orthocarpus pilosus Wats. Bot. King. Surv. 231 (1871).
Damp meadows, altitude 2,150 meters (7,000 feet), July 20 (No. 71); alpine, altitude 3,390 meters (11,000 feet), July 15 (No. 27).
This species is not included in Coulter's Manual of the Rocky Mountain Region. It has been collected in Wyoming before, however, by Letterman, Tweedy, and myself.

Pedicularis contorta Benth. in Hook. Fl. Bor. Amer. ii, 108 (1838).

Grassy slopes, altitude 2,150 meters (7,000 feet), July 20 (No. 67).

These specimens differ from the description in having pink instead of white flowers, and the spikes tardily glabrate instead of glabrous. This has not before been reported from Wyoming; in fact, is not included in Coulter's Manual of the Rocky Mountain Region. The range as given by Dr. Gray in the Synoptical Flora is "Oregon and Idaho." The plant, however, has been collected in western Montana by Dr. Watson.

Pedicularis parryi Gray, Amer. Journ. Sci. ser. 2, xxxiv, 250 (1860).

Alpine, altitude 3,390 meters (11,000 feet), July 15 (No. 30).

Pedicularis scopulorum Gray, Syn. Fl. ii, pt. i, 308 (1878).

Subalpine, altitude 3,230 meters (10,500 feet), July 15 (No. 22); grassy slopes, alpine, altitude 3,390 meters (11,000 feet), July 20 (No. 48); altitude 2,090 meters (6,800 feet), July 21 (No. 72).

Abronia micrantha Torr. in Frem. First Rep. 96 (1843); *A. cycloptera* Gray, Amer. Journ. Sci. ser. 2, xv, 319 (1853).

Sand hills along Sage Creek below Corbett, altitude 2,000 meters (6,500 feet), July 21 (No. 96).

Corispermum hyssopifolium L. Sp. Pl. i, 4 (1753).

Alkaline flats along Sage Creek below Corbett, altitude 2,000 meters (6,500 feet), July 21 (No. 93).

Polygonum bistortoides Pursh, Fl. i, 271 (1814).

Altitude 2,400 meters (7,800 feet), July 15 (No. 8).

Rumex geyeri (Meisner) Trelease, Mo. Bot. Gard. 1892, 78 (1892); *R. engelmanni geyeri* Meisner, in DC. Prodr. xiv, 64 (1856); *Rumex paucifolius* Nutt.; Wats. Bot. King. Surv. 314 (1871).

Crevices of rocks, altitude 2,770 meters (9,000 feet), July 20 (No. 35).

Salix barrattiana tweedyi[1] Bebb, var. nov.

"Leaves at first thinly overspread on the upper surface with floccose hairs, soon smooth and green both sides; capsules glabrous." In bogs and along mountain streams, altitude 2,460 to 3,080 meters (8,000 to 10,000 feet). Head of Big Goose Creek, Big Horn Mountains, July 15 (Nos. 11 and 12).

"*Salix barrattiana* is one of the rarest of North American willows. For more than fifty years it was known only from Drummond's specimens in the Hookerian herbarium. Type locality, 'Alpine swamps in the Rocky Mountains.' It was rediscovered by Prof. John Macoun, July 28, 1885, 'in thickets at high elevations, Kicking Horse Lake,' * * * and later, August, 1890, was collected in the same locality by Mr. James Macoun, in fine specimens of both fruit and mature leaves.

"These later collections only confirmed the characterization originally given the species by Hooker; among the numbers of the Lanatæ group *S. barrattiana* still remained conspicuous for its 'silky-pubescent' leaves ('silvery-silky when young') and capsules cano-sericeus. That there should be more or less variation in this vesture

[1] The description of this variety and the notes upon *S. barrattiana* and *S. glauca* as found in the text were sent me in a letter by the late M. S. Bebb in May, 1894. In this letter he speaks of the willows as follows: "I found Mr. Tweedy's collection of exceptional interest, all the forms differing more or less from familiar Rocky Mountain prototypes, and one of them, which you will see, I have designated *Salix barrattiana* [*tweedyi*], not only a capital find so far as the species alone is concerned, but presenting furthermore a very striking variation from the 'silvery-silky' typical form." The varietal name used by Mr. Bebb being preoccupied has been changed to the one given above.

was to be expected from what is known of the two most nearly allied species. *S. hookeriana* was first described as having 'very smooth' capsules, but subsequent observations have shown that they are more frequently tomentose, and a like variation, though in less degree, prevails in the case of *S. richardsonii;* but in neither is this variation so pronounced as to lessen the surprise with which we find the one species of the group heretofore most conspicuous for its silky vesture appearing, as in Mr. Tweedy's specimens, so markedly glabrate. The leaves, and in fact the aments as well, bear a very close and deceptive resemblance to some forms of *S. barclayi;* but the aments are closely sessile, terminal as well as lateral, the styles longer and the stigmas bifid; the leaves alone could scarcely be distinguished one from the other."

The type specimens have been deposited in the United States National, the Gray, and the Kew herbariums.

Salix brownei petræa (Anders.) Bebb, Bot. Gaz. xvi, 107 (1861); *Salix petræa* G. Anders. in Forbes, Salict. Woburn. 193, t. 97 (1829).

Subalpine, altitude 3,230 meters (10,500 feet), July 15 (No. 20).

Salix chlorophylla Anders. Vet. Acad. Handl. Stockh. vi, no. 1, 138 (1867).

Alpine; wet cold slopes, altitude 3,080 meters (10,000 feet), July 20 (No. 47).

Salix glauca L. Sp. Pl. ii, 1019 (1753).

"Alpine form. This might with propriety, from the description alone, be referred to *S. glauca alpina* Anders. DC. Prodr. xvi, pt. 2, 281, but the author cites *S. glauca macrocarpa* Ledeb., as a synonym and apparently with the illustration given in Ledebour's Flora Rossica, fig. c, tab. 468. Our plant has little in common as a specialized form of *S. glauca.*"

Subalpine, altitude 3,230 meters (10,500 feet), July 15 (No. 19).

Salix glauca villosa (D. Don) Bebb; *Salix villosa* D. Don; Hook. Fl. Bor. Amer. ii, 144 (1838).

In wet bogs and on wet, cold slopes, altitude 2,770 to 3,390 meters (9,000 to 11,000 feet), July 20 (Nos. 41 and 46).

Salix myrtillifolia curtiflora (Anders.) Bebb; *S. curtiflora* Anders. Oefvers. Vet. Akad. Foerhandl. xv, 130 (1858).

In bogs, altitude 2,560 meters (8,200 feet), July 20 (No. 62).

Populus deltoides Marsh. Arb. Amer. 106 (1785); *P. monilifera* Ait. Hort. Kew. ed. 1, iii, 406 (1789).

Sage Creek, near Corbett, altitude 2,000 meters (6,500 feet), July 21 (No. 91).

Allium brevistylum Wats. Bot. King. Surv. 350 (1871).

Bogs, altitude 2,300 meters (7,500 feet), July 21 (No. 86).

Allium schœnoprasum L. Sp. Pl. i, 301 (1753).

Bogs, altitude 2,300 meters (7,500 feet), July 21 (No. 87).

Juncoides campestre (L.) Kuntze, Rev. Gen. Pl. ii, 722 (1891); *Juncus campestris* L. Sp. Pl. i, 329 (1753); *Luzula campestris* DC. Fl. Fr. iii, 161 (1805).

Altitude 2,400 meters (7,800 feet), July 15 (No. 9).

Carex atrata L. Sp. Pl. ii, 976 (1753).

High alpine, altitude 3,450 meters (11,300 feet), July 21 (No. 88); meadows and bogs, altitude 2,460 meters (8,000 feet), July 21 (No. 76).

Carex capitata L. Syst. ed. 10, ii, 1261 (1759).

Alpine, 3,390 meters (11,000 feet), July 15 (No. 3).

Carex festiva Dew. Amer. Journ. Sci. xxix, 246 (1836).

Altitude 2,150 meters (7,000 feet), July 20 (No. 70).

Carex hoodii Boott, Hook. Fl. Bor. Amer. ii, 211, t. 211 (1839).

Altitude 2,150 meters (7,000 feet), July 20 (No. 69).

Carex nova Bailey, Journ. Bot. xxvi, 322 (1888).
Altitude 3,390 (11,000 feet), July 15 (No. 1).

Carex scirpoidea Mx. Fl. Bor. Amer. ii, 171 (1803).
Alpine, altitude 3,390 meters (11,000 feet), July 15 (No. 2).

Carex tolmiei subsessilis Bailey, Mem. Torr. Club, i, 47 (1889).
Altitude 2,400 meters (7,800 feet), July 15 (No. 10); altitude 2,150 meters (7,000 feet), July 20 (No. 68).

Savastana odorata (L.) Scribner, Mem. Torr. Club, v, 34 (1894); *Holcus odoratus* L. Sp. Pl. ii, 1048 (1753); *Hierochloa borealis* Roem. & Schult. Syst. ii, 513 (1817); *Holcus borealis* Schrad. Fl. Germ. i, 252 (1806).
Altitude 2,460 meters (8,000 feet), July 20 (No. 53).

Faxon del

LEIBERGIA OROGENIOIDES Coulter & Rose.

ROSEANTHUS ALBIFLORUS Cogniaux.

LEIBERGIA, A NEW GENUS OF UMBELLIFERÆ FROM THE COLUMBIA RIVER REGION.

By JOHN M. COULTER and J. N. ROSE.

A part of the material upon which this new genus is based has been in the National Herbarium a half dozen years, and is doubtless to be found in many of our herbaria, either undetermined or incorrectly named. The receipt of some excellent additional material from Mr. W. N. Suksdorf and an abundant supply from one of our field agents, Mr. John B. Leiberg, gives the opportunity of separating what has appeared to us for some time to be a new genus.

Leibergia, gen. nov.

Calyx teeth obsolete. Fruit flattened laterally, linear, beaked, glabrous; stylopodium wanting. Carpels only slightly flattened dorsally, with five filiform ribs, the two lateral a little more prominent and turned inward; oil tubes small, single in the intervals, two on the commissural side. Seed face broad, slightly concave, but when dry becoming more or less involute.

Slender, glabrous, acaulescent plants from small globose tubers: leaves ternately divided into long, filiform leaflets; umbels irregular; fruit subsessile; flowers white.

The affinities of this genus are doubtful. It has much the habit of the bulbous Peucedanums of the Northwest, but the lateral flattening of the fruit and the absence of wings readily exclude it from that genus. Our plant is very closely allied to the two anomalous species, *Peucedanum ambiguum* and *P. leptocarpum*, which likewise have linear fruit with very narrow lateral wings, and is, perhaps, congeneric with them. The dorsal flattening of the fruit has hitherto been considered such an important character that it seems best, at least for the present, to base our generic distinction on this difference rather than to include these two species in the new genus. It also has the habit of Orogenia, but lacks the peculiar carpel of that genus. Technically it seems to come near Oreomyrris and Chærophyllum. From the former it differs in having a compound umbel, and from the latter principally in its peculiar habit, obsolete stylopodium, and less prominent ribs.

Leibergia orogenioides, sp. nov. PLATE XXVII.

Slender, 1.2 to 5 dm. high: leaves nearly as long as the flowering peduncle; leaflets 1.0 to 7.5 cm. long, entire or with few teeth or linear lobes: rays of the umbel three to ten, very slender, often spreading, very unequal, 2 to 12 cm. long; umbellets with few flowers and fruits; pedicels 2 mm. or less long; involucre wanting: involucels three to four, small, somewhat united at base: fruit 8 mm. long, flattened laterally, but terete at base, terete and somewhat beaked at apex.

Collected by John B. Leiberg in the Santianne Creek bottoms, Cœur d'Alene Mountains, Idaho, June 24, 1895, at an altitude of 950 meters (No. 1027). Also by Mr. W. N. Suksdorf in Spokane County, Washington, in low damp ground along

streams, May 13, 1889. Mr. Suksdorf at this time obtained bulbs which he has since grown in his garden, and he has thus obtained most excellent fruit.

We take great pleasure in dedicating this genus to John B. Leiberg, of Hope, Idaho, a most excellent collector and one who has done much in developing our knowledge of the flora of Idaho, Washington, and Oregon. Mr. Leiberg writes as follows:

"The plant, in the region where I collected it, occupies the same place in the flora of the heavily forested region of the lower white pine zone as do the tuberous-rooted, early-flowering species of Peucedanum on the open plains of the Columbia, in Oregon, Washington, and Idaho; that is to say, it is an early-flowering species, coming into bloom very soon after the snow leaves, preferring basaltic formations, or soils derived from basaltic rocks. Wherever it grows it appears in such abundance that at the time of flowering it quite hides all other species."

EXPLANATION OF PLATE.—Fig. 1, the plant, natural size; fig. 2, an umbellet of flowers; fig. 3, fruit as seen from the side; fig. 4, carpel as seen from the back; fig. 5, cross section of the fruit.

ROSEANTHUS, A NEW GENUS OF CUCURBITACEÆ FROM ACAPULCO, MEXICO.

By ALFRED COGNIAUX, Verviers, Belgium.

Roseanthus Cogn., gen. nov.

Flores monoici[1] omnes axillares, solitarii. Masculi rares, longe pedicellati. Calycis tubus longe tubulosus, angustus, superne leviter dilatatus; lobi 5, breviusculi, triangulari-lineares. Corolla anguste campanulata, usque ultra medium 5-fida, segmentis integris oblongis acutis. Stamina 3, supra medium tubi calycis inserta, filamentis liberis, elongatis, capillaribus; antheræ in capitulum connatæ, una unilocularis caeterae biloculares, loculis linearibus longitudinaliter triplicatis, connectivo angusto non producto. Pollen subsphæricum, subtiliter sparseque muriculatum. Pistillodium nullum. Flores feminei: Calyx supra ovarium et corolla maris. Staminodia nulla. Ovarium anguste ovoideum, 4–5-placentiferum, multilocellatum, locellis uniovulatis, ovulis horizontalibus; stylus capillaris, elongatus, disco basilari nullo, stigmatibus 3 elongatis profunde bifidis, lobis divaricatis. Fructus siccus, indehiscens, multilocellatus, locellis monospermis longitudinaliter 4–5-seriatis, pericarpio tenui. Semina late ovata, lævia, valde complanata, marginibus subalatis integerrimis.

Herbæ annuæ, scandentes. Folia petiolata, membranacea. Cirrhi 2–3-fidi.[2] Flores majusculi, albi. Fructus mediocris, globusus, lævis.

This genus belongs to the series Plagiospermeæ. It is near Cucurbita, but differs in the color of the flowers, shape of calyx, insertion of stamens, and absence of staminodia.

Perhaps, however, it should be placed by the side of Schizocarpum, from which it differs chiefly in its diœcious flowers, the absence of pistillodia, the three bifid stigmas, and the indehiscent fruit.

I dedicate this new genus to Dr. J. N. Rose, the First Assistant Botanist of the United States Department of Agriculture, in Washington, who has recognized its characters and affinities, and to whom I am moreover indebted for specimens of various new Cucurbitaceæ and Melastomaceæ.

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[1] I have taken the liberty of changing Professor Cogniaux's *dioici* to *monoici*. The first set of plants grown contained one specimen which produced male flowers only, while all the others produced female flowers in abundance. It was a part of these plants that were sent to Professor Cogniaux. Since then I have grown two other plants, which for three or four weeks have been producing many female flowers but no male flowers. At length, however, male flowers have begun to appear.—J. N. R.

[2] The tendrils have a curious habit when running over other plants (as for instance the tomato) of forming small disks, by which they adhere. These disks not only occur at the end of the tendrils, but also at a considerable distance back from the tip.—J. N. R.

Roseanthus albiflorus, sp. nov. PLATE XXVIII.

Slender vines, 9 to 12 dm. long, angled, pubescent: leaves ovate in outline, 3-lobed; middle lobe ovate, acuminate, constricted near its base, with small apiculate teeth, base with a broad open sinus: peduncle of male flowers 5 to 7.5 cm. long, of female flowers 4 to 6 mm. long: corolla 5 to 6 cm. broad: fruit the size of a small orange.

Collected by Dr. Edward Palmer in fruit near Acapulco, Mexico, March, 1895 (No. 599).

Flowering specimens were raised by J. N. Rose from seed in the greenhouses of the United States Department of Agriculture at Washington.

EXPLANATION OF PLATE.—Fig. 1, a branch of the male plant; fig. 2, a branch of the female plant; fig. 3, the male flower laid open; fig. 4, the pistil; fig. 5, the fruit; fig. 6, the seed.

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[Synonyms printed in italics.]

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